# AMERICAN MACHINIST

*November* 15, 1939

**Facing the World**—*Facing medium caliber shells is one step in preparedness that enables the U. S. to face the future with realistic reserve (page 943)*


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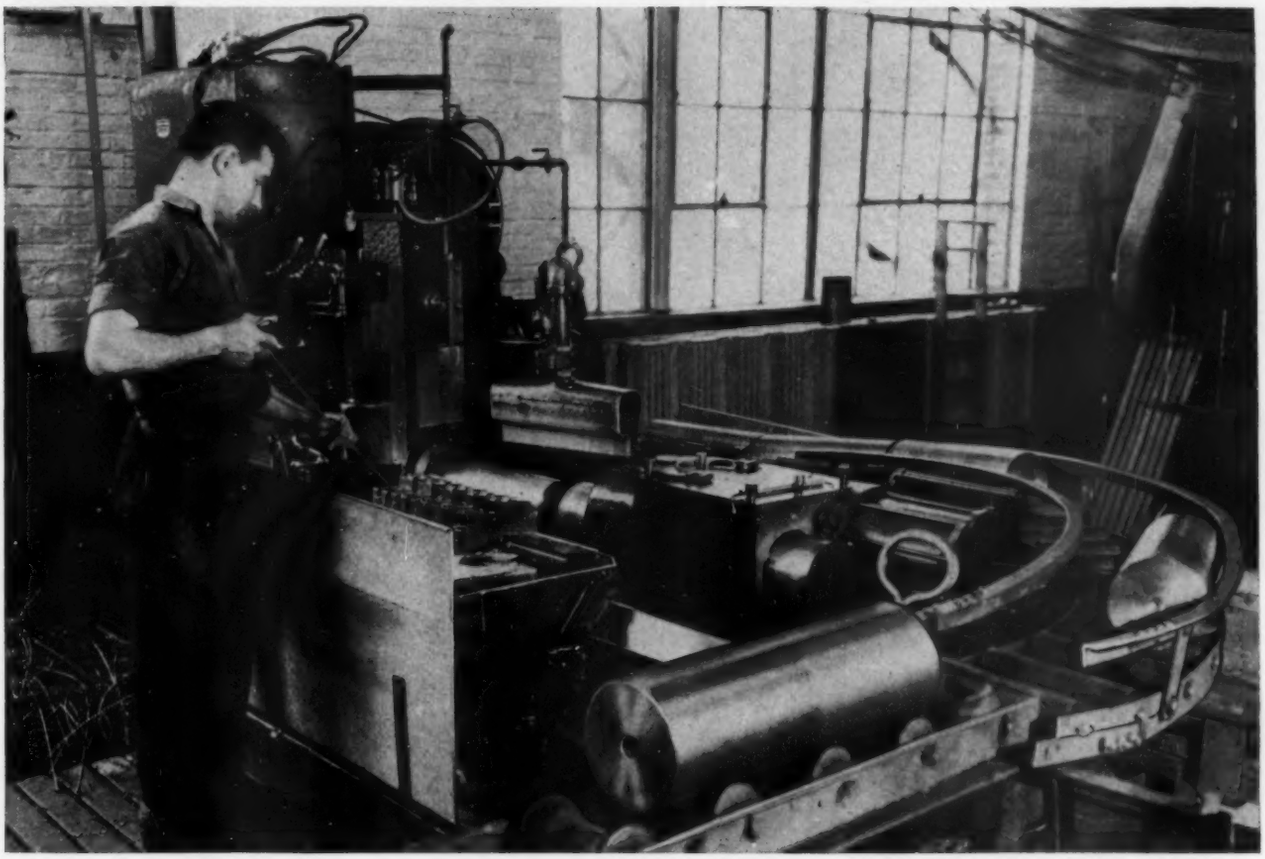
**For 62 years, your — and Metal-Working America's—textbook of methods and equipment**

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor



*After the shell is centered, five tools in a Lo-Swing lathe rough turn the outside diameter. The forging is held inside the bore at one end and on the center at the other. Tungsten carbide tools are used in this and other operations where they have been found suitable. A copious supply of soluble oil is used*

# The Story of a Shell

**Shells start in our arsenals. In times of peace they end in our proving grounds and ammunition depots. May they never have to go farther**

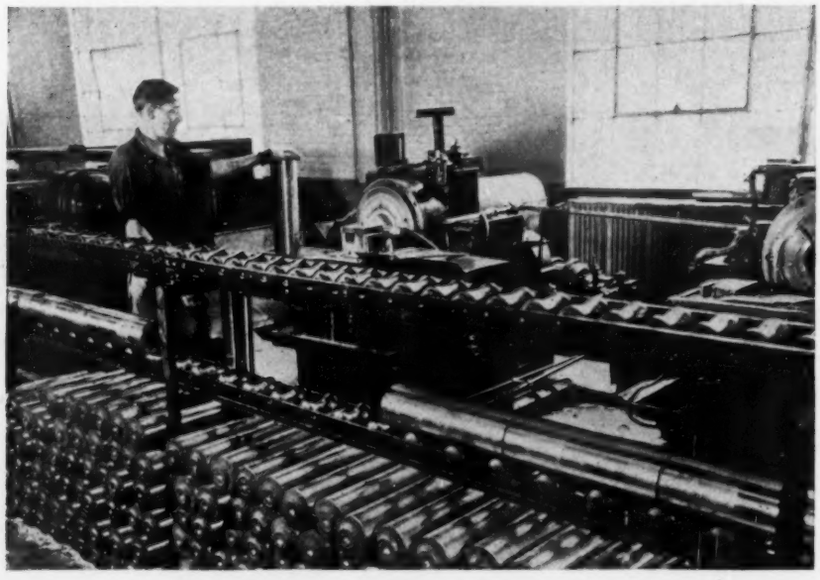
By JOHN HAYDOCK
*Managing Editor, American Machinist*

SHELLS ARE MADE for destruction. They are designed to destroy the fortifications, the ships, the industrial plants and the lives of enemies in time of war. These facts are obvious, and there is no use mincing words about them.

But shells can also fill a constructive function. By adding to military strength, they play a part in preserving peace; they form a major means of insurance against aggression.

An important function of the Army arsenals is to serve as pilot plants for private industry. They keep the art of munitions making alive in times of peace. One of the best examples of such service is the medium caliber shell production line at Frankford Arsenal. The operations described and pictured here are the result of a planned development. Like all good developments, that of shell manufacture is dynamic. Experiments for its improvement are continually in progress; they will be put into practice as soon as they prove their worth and funds are made available for the new equipment that will be needed.

The manufacture of the shells is

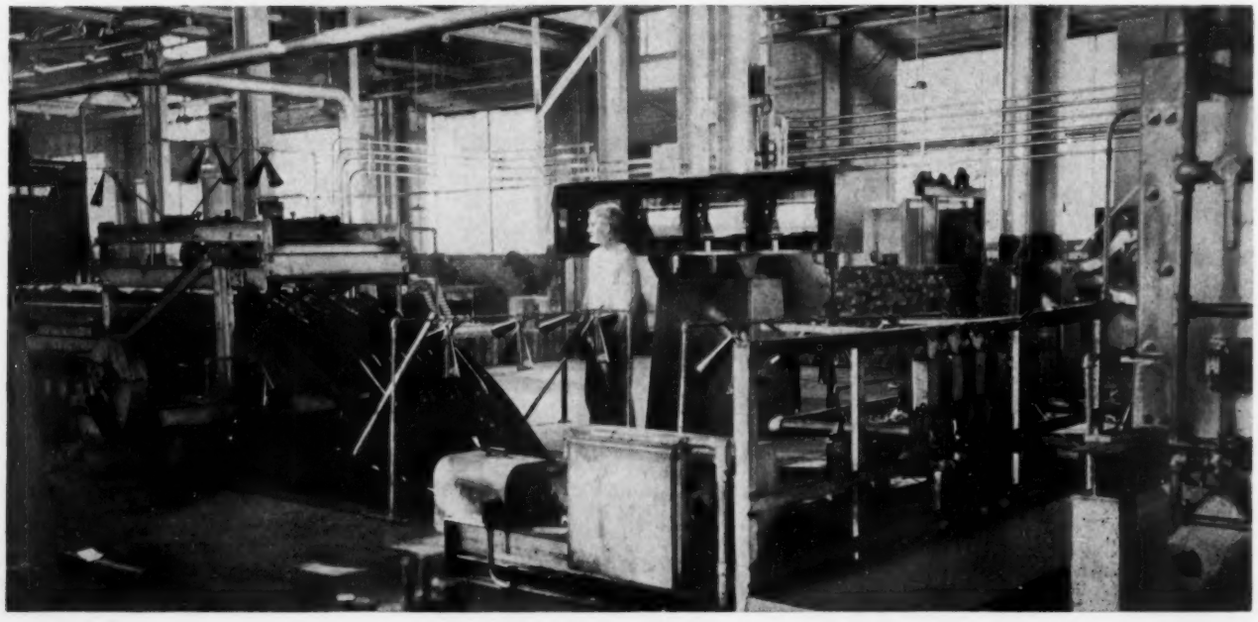


not shown here to publicize an instrument of destruction. The purpose is rather to disseminate information on the methods that are currently used with success by the Ordnance Department of the U. S. Army. Private industry prefers to make plowshares; but as part of national preparedness it must know how to make shells, too, if called upon to do so.

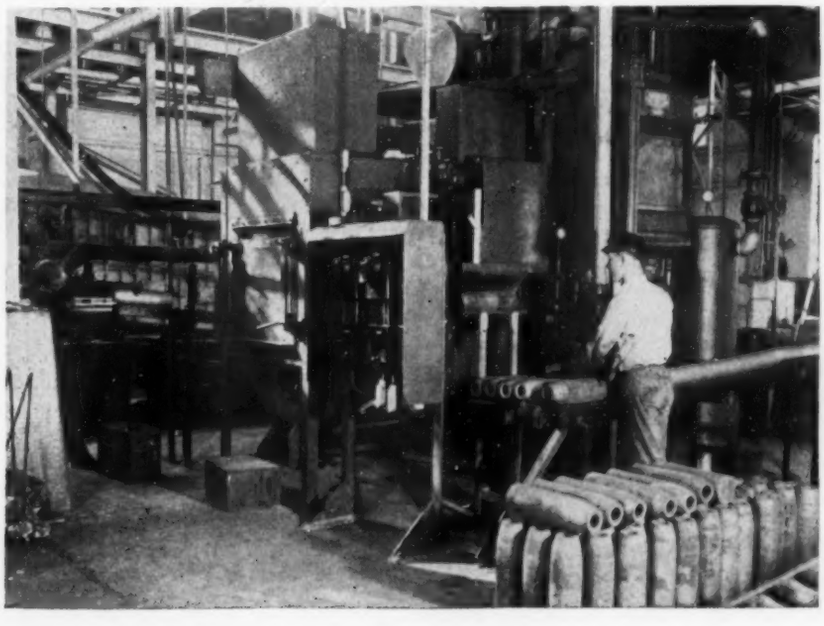
*Closed ends are faced in a battery of Frey facing machines. Each tool holder carries two cutters, one for roughing and one for semi-finishing. The work is held in an air chuck. Following this operation, the shells are recentered and carried to the forge shop on an overhead continuous chain conveyor*

*In the forge shop, the shells are heated in a battery of automatic Ajax-Northrup electric induction furnaces, six furnaces being used for this purpose. Noses are hot formed in a 20-in. stroke Bliss crank press*

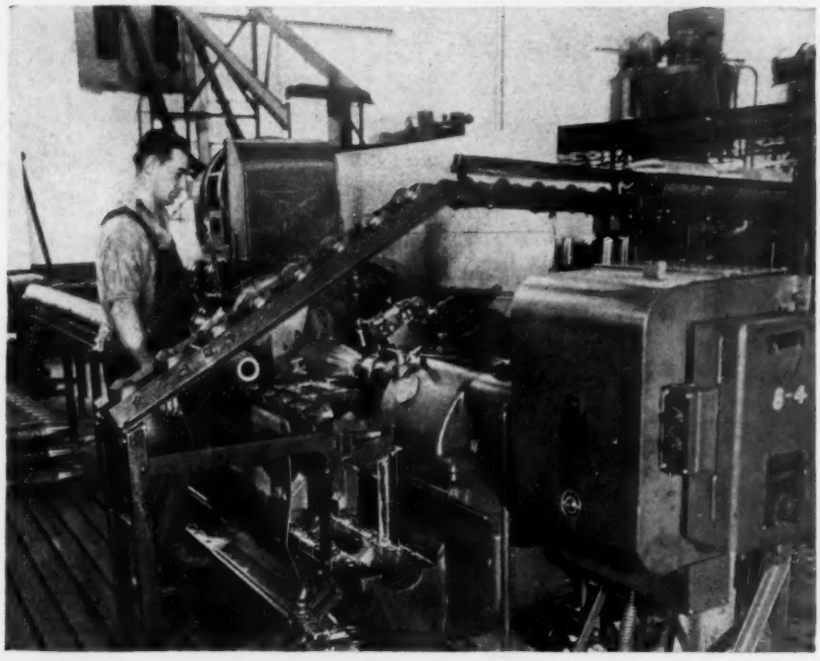
*After nosing, the shells are heat-treated. They are carried through con-continuous Surface Combustion gas-fired furnaces which heat and draw the steel automatically. A walking-beam feed is used on both the heating and drawing furnaces. The pieces when heated are dumped into the oil quench and carried out on a roller conveyor. Furnace heat is controlled by recording pyrometers. Note the fire extinguishing system above the quenching bath and conveyors*



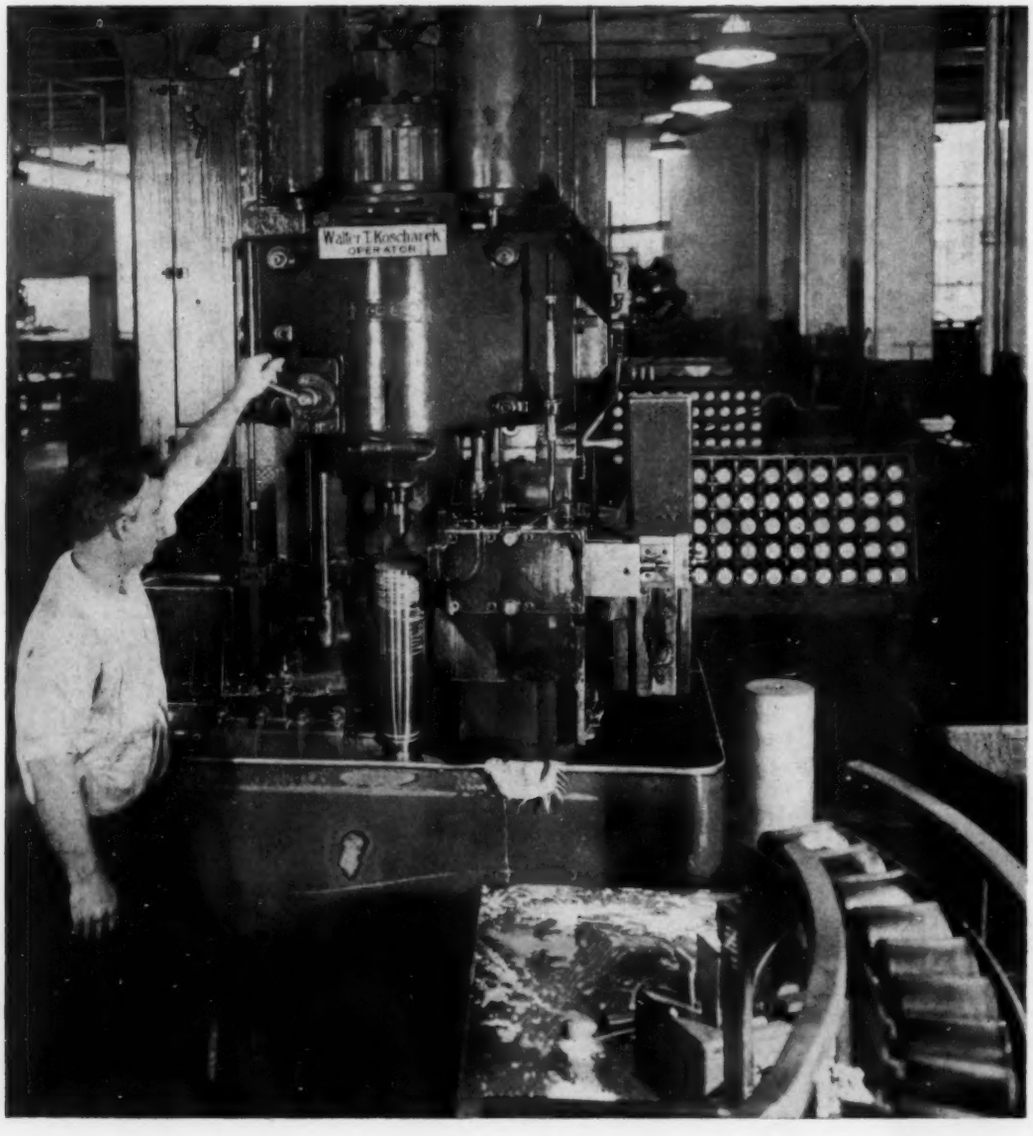
*Steel forgings for the medium-caliber shell are purchased from outside vendors with a finish-forged cavity. They are trimmed to length with a hacksaw in the basement of the shell shop and carried to the main floor by means of an endless chain conveyor. Automatically transferred to the first of a series of gravity conveyors, the shells go to a Foster centering machine for their first machining operation*



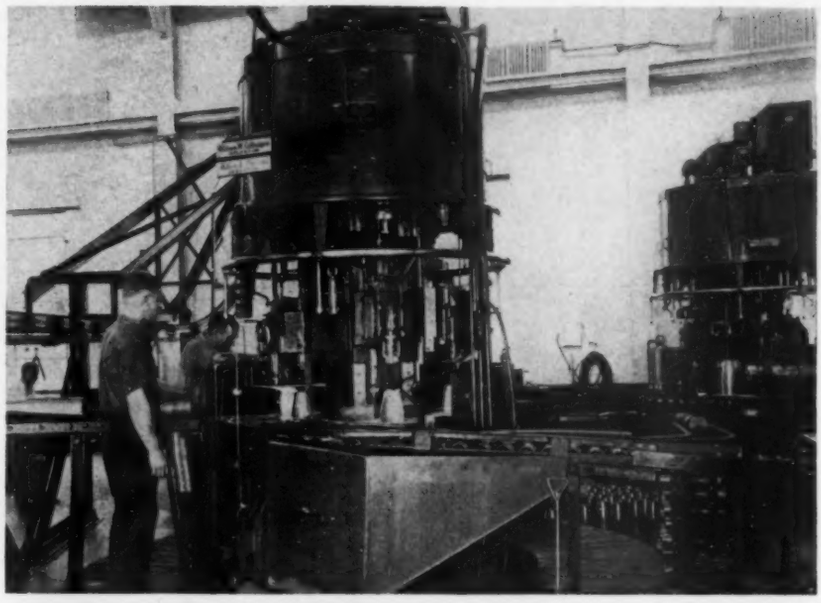
*Heat-treated shells are cleaned in this automatic Pangborn shot-blasting machine. The pieces are elevated to the machine opening on a pneumatic lift. Three blasting nozzles clean the shells in the bore and on the outside. At the exit end of the machine, an inspector examines the bores with a portable spot light. The shells are then transferred to the overhead chain conveyor for return to the machine shop*



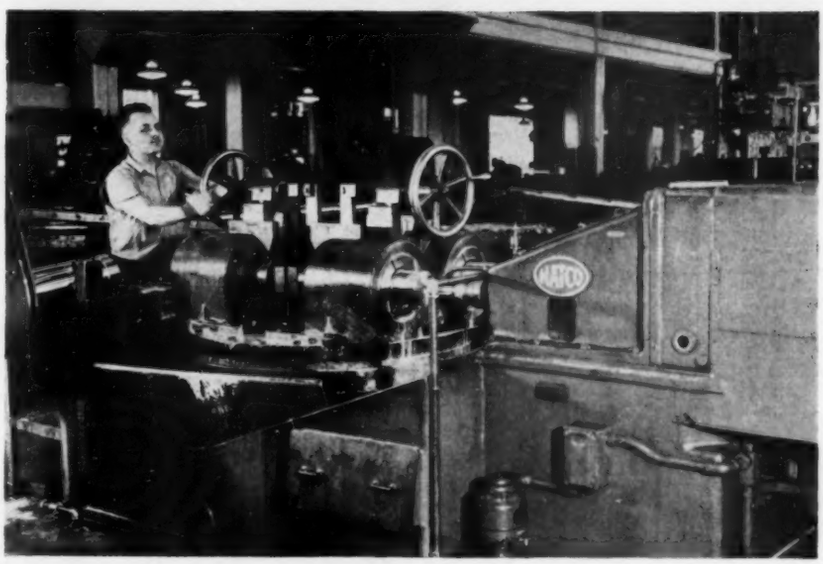
*This LeBlond lathe rough turns the ogive or rounded nose of the shell. A form plate is used to guide the tool through the correct contour. The pieces are received at working level and passed over the machine on a second gravity conveyor for the next operation*



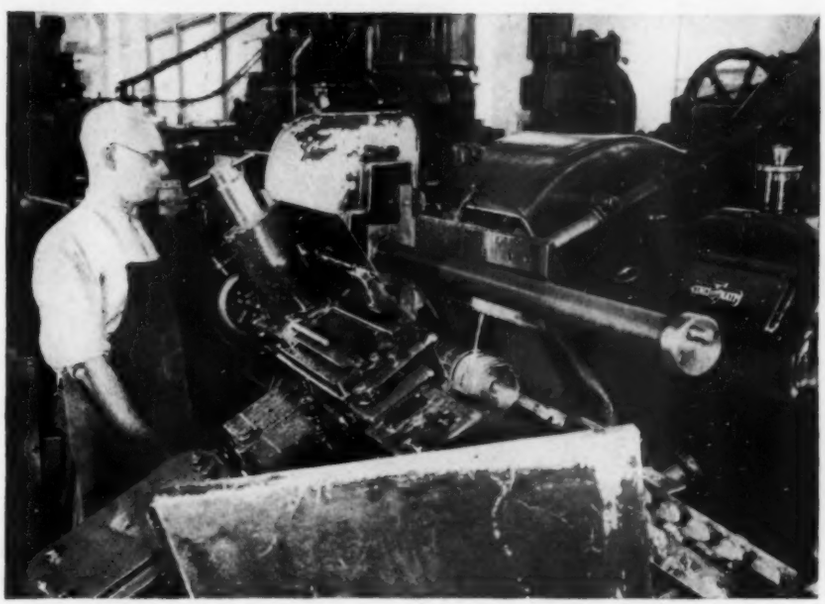

*Outside diameter and nose are finish turned in this Ex-Cell-O vertical lathe. Tools are fed hydraulically, one upward from the bottom, cam guided to form the ogive and the other downward from the top*



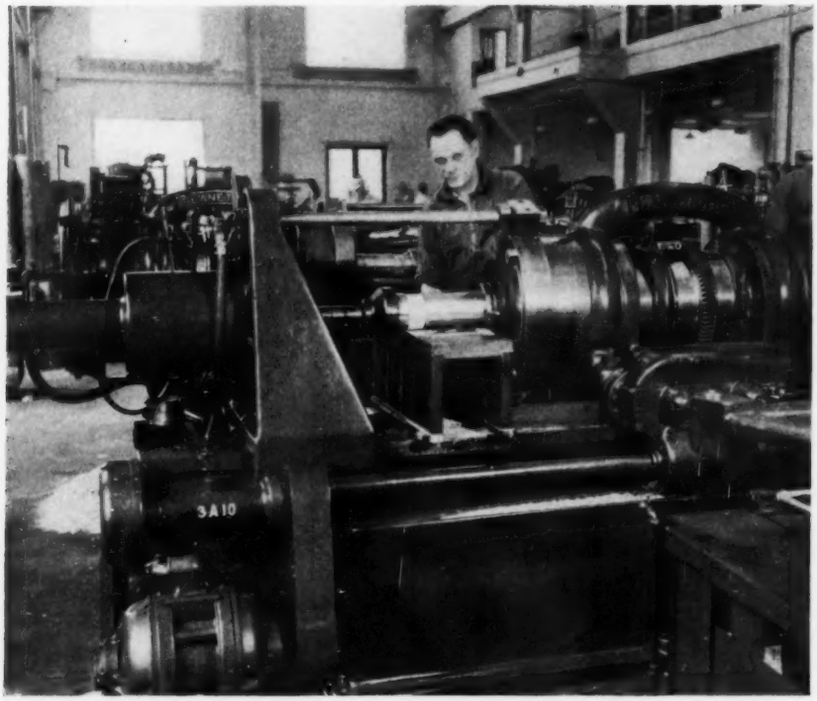
*A six-spindle Bullard Mult-Au-Matic finishes the nose, which includes boring, facing, chamfering, tapping and cutting the windshield groove. After finish turning, another battery of Bullards does a similar series of operations on the base. These operations include drilling and counterboring, turning the band seat, facing the base, reaming the fuze hole and rounding the edge*



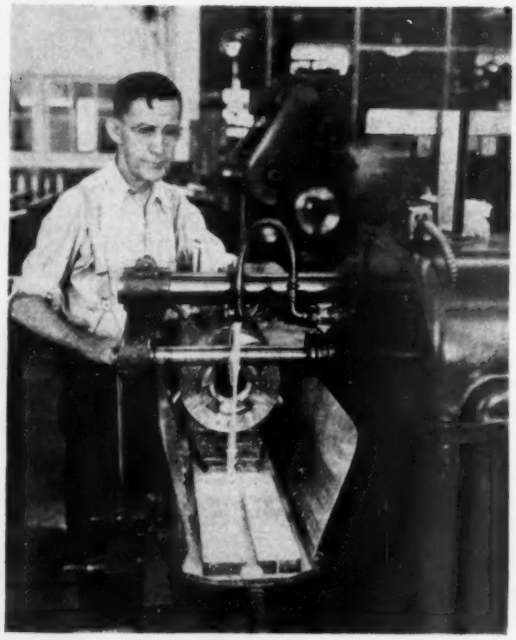

*Shells are stamped for lot number, type, arsenal and commanding officers' initials in a hydraulic press and then go to this Natco machine to have the fuze plug holes tapped. Two shells are machined at a time while two more are being loaded in the twin table fixture. The threads are left-hand and are cut in less than a minute*



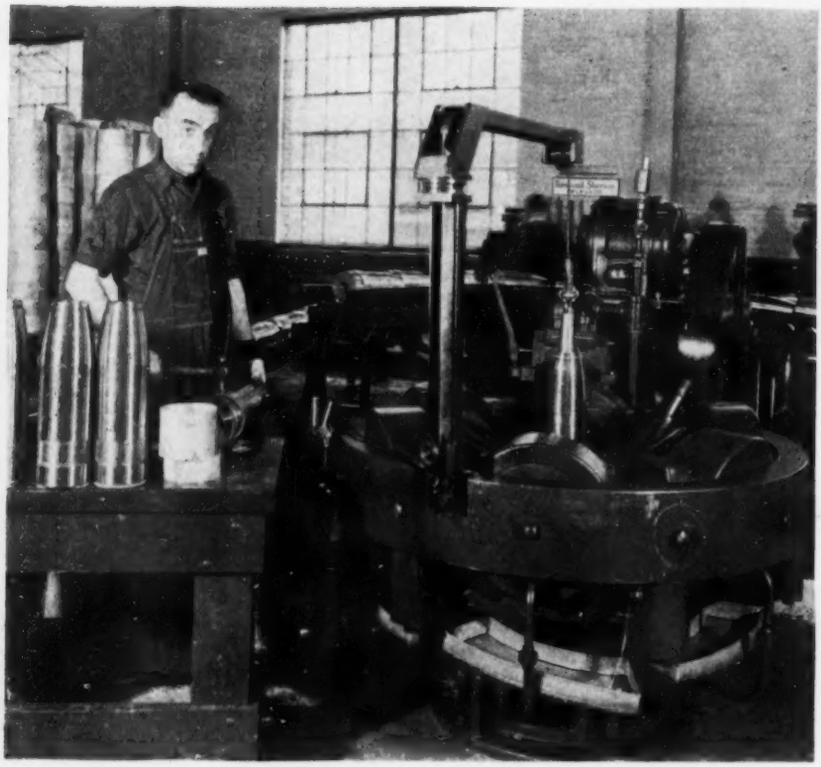
*The band seats are scored before the shells travel to this Cincinnati centerless grinder to finish the bourrelet, or surface on which the shell rides through the bore of the gun. There are really three surfaces to be ground —one at the nose end and the other two on either side of the band seat*



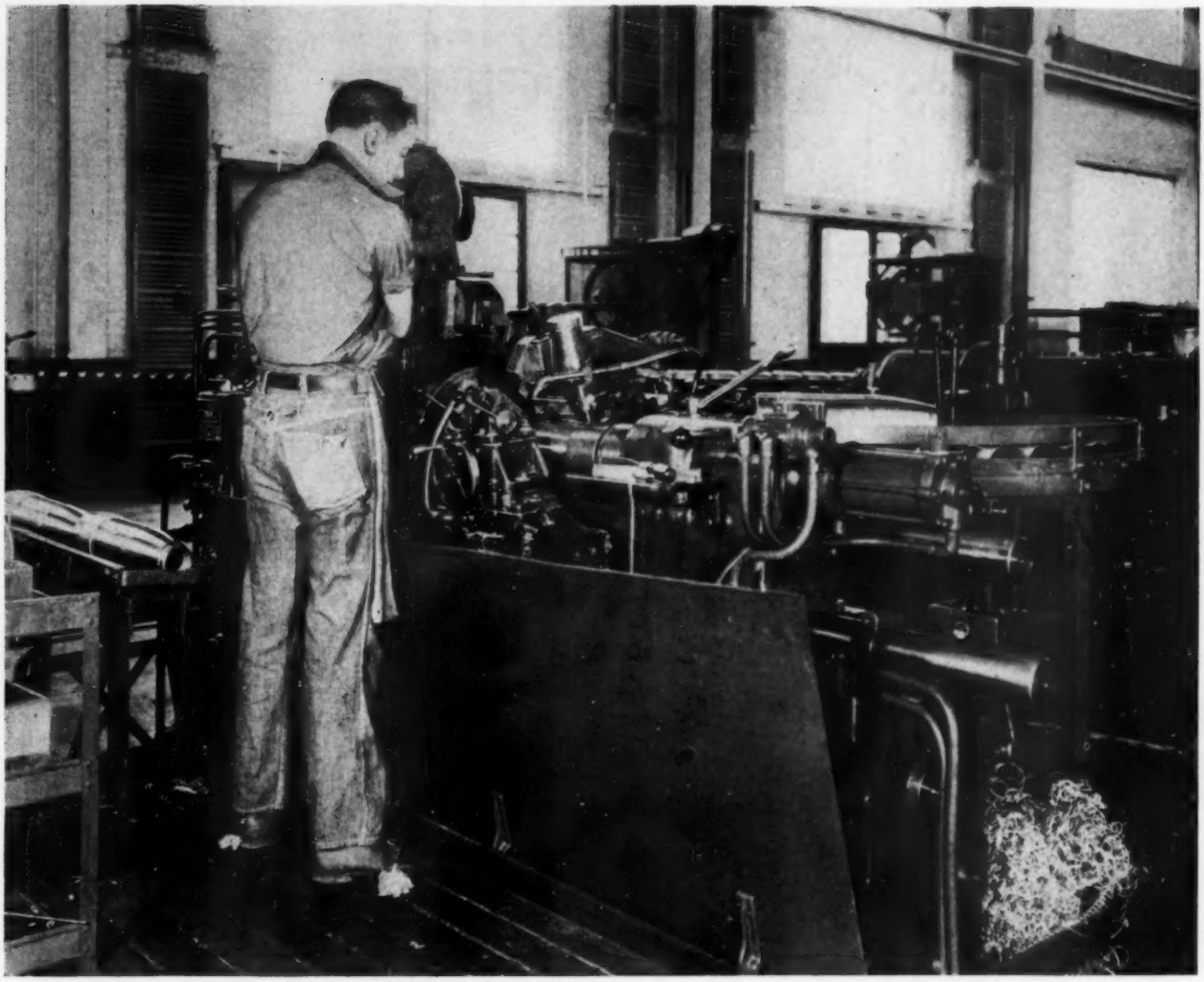
*A Hall planetary milling machine cuts the thread in the nose for the windshield. The weight of the shell is then checked in a beam scale set into the gravity conveyor. If overweight, some of the metal is removed by boring the cavity. Otherwise the forged cavity is left untouched by machine*



*Three notches, 120 deg. apart, are cut in the shell nose by a Producto-Matic milling machine. A hand indexing fixture is used with hand lever feed*



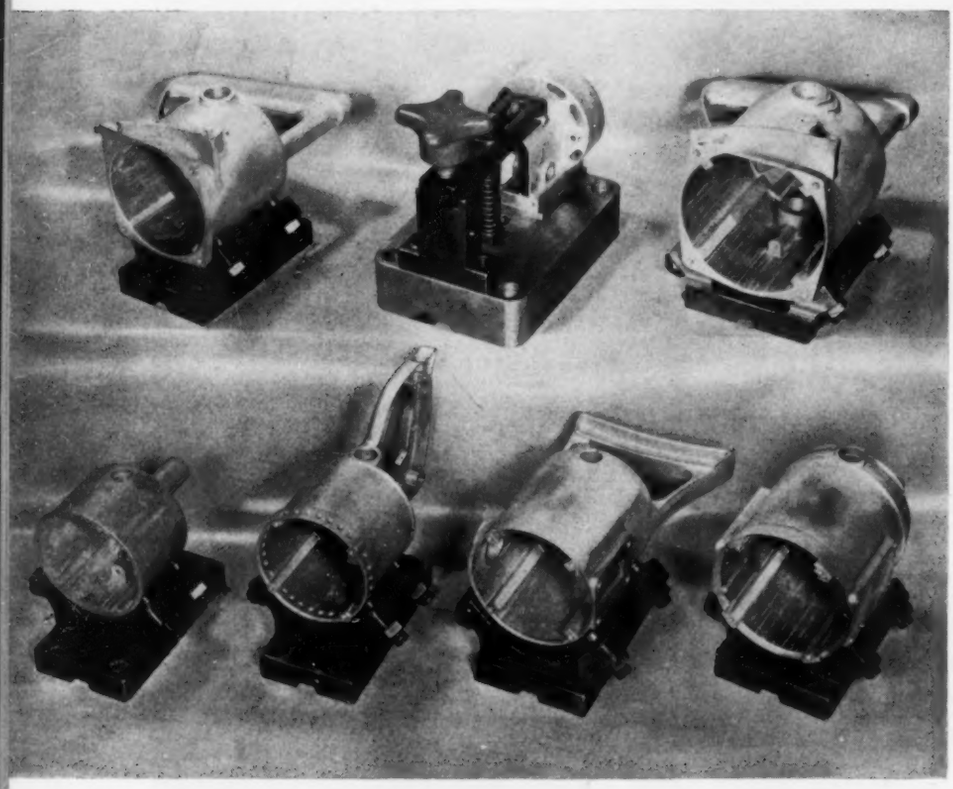
*Copper rotating bands are pressed in place using a 1,200-lb. West machine. Pressure is used at three axial positions and three radial positions for each axial position, making nine squeezes in all*



*Bands are turned in a Fay automatic lathe. This machine not only performs the turning proper but also skives the ends of the band and stamps it with a rotating tool. Gravity conveyors, after this operation, use rubber rollers to protect the bands. The shells are taken by elevator to the lower floor for cleaning, inspection, painting and shipping*

*Finished shells are weighed and then gaged for size. A Pratt & Whitney Electrolimit gage simultaneously checks seven points on the shell's outside diameter. On the buttons above the shell a green light means oversize, a red light undersize. Cavities of the shells are then sprayed with acid-proof black paint and the outsides are sprayed with an identifying color. The fuze adapter is screwed into the nose and sealed with a plug. Then the shells are boxed to be shipped to the loading depot*

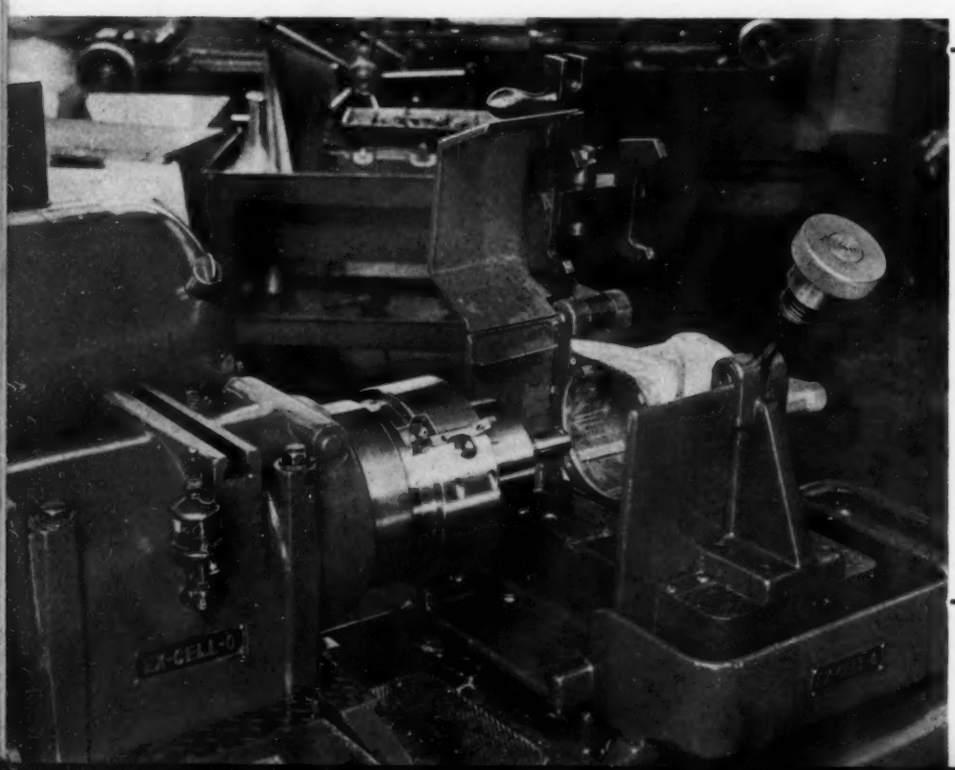
# Fixtures Aid Precision Boring



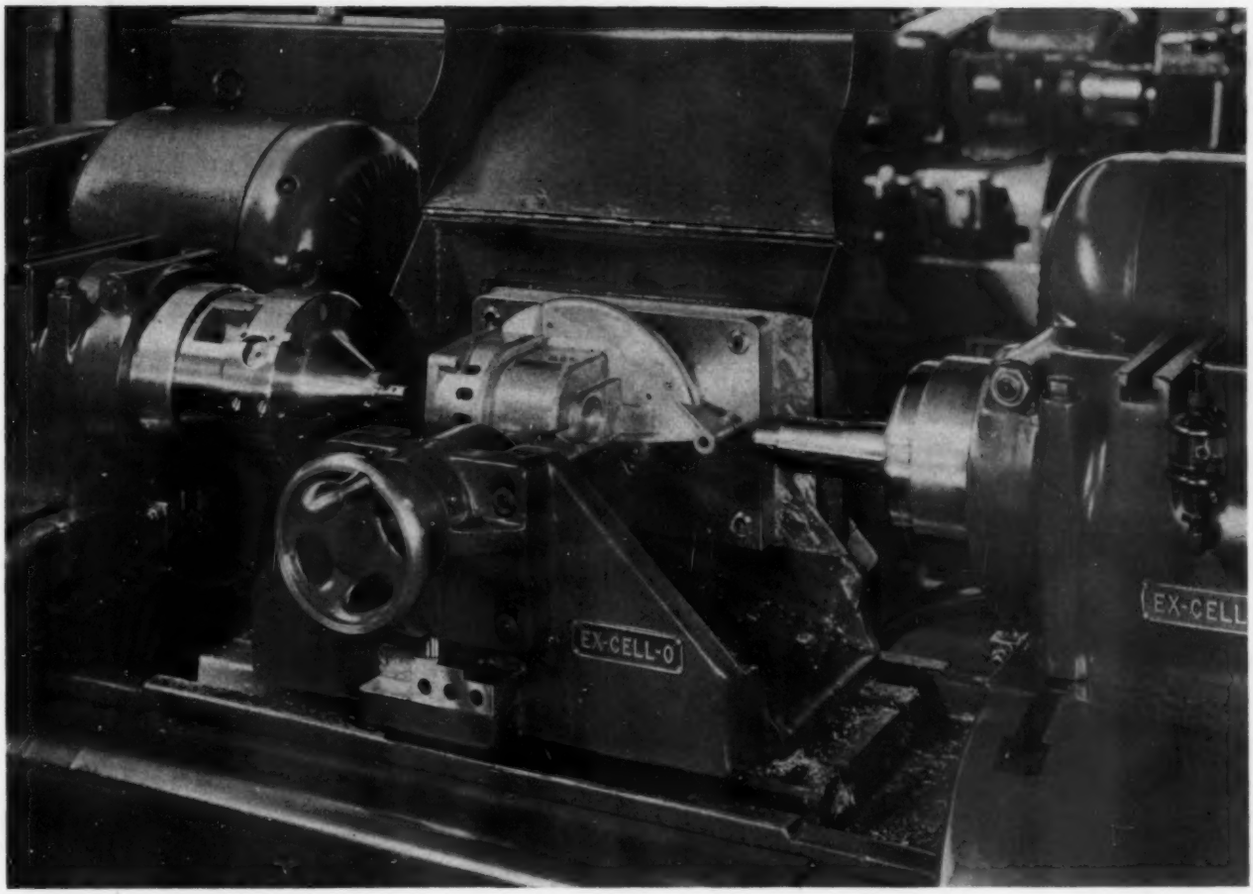
A TOTAL of eight interchangeable fixtures, seven of which are shown here, and eight cutter heads are used on the single-end machine for boring and facing rear housings. Change-over time averages about ½ hr. Selective assembly and hand fitting have been almost entirely eliminated because of the uniformly accurate parts produced in this set up. The single-end machine also has been set up for other jobs, such as boring the bearings and turning the outside diameter of rollers for belt sanders. These rollers formerly were bored and turned, and then ground, but improved finish and greater accuracy are possible by precision boring and turning.

TEN FIXTURES, interchangeable on one or the other of two precision boring machines, are used by Skilsaw, Inc., to hold die-cast aluminum housings for electric tools during boring and facing operations. Simple in design, these fixtures are sufficiently accurate to permit the operator consistently to work within a 0.0005 in. manufacturing tolerance for bearing bores. It has been estimated that machining cost has been reduced 66 2/3 per cent on rear housings and as much as 87 per cent on some front housings since the installation of these machines.

The housings previously were bored and faced on three hand screw machines. Since high surface speeds are required for the production of good finishes, difficulty was encountered in holding size and securing economical tool life with the previous set-up. In front housings, proper alignment between bearing holes could not be obtained because four chuckings of each part were required. All of these housings were selected for assembly and slowly fitted by hand.

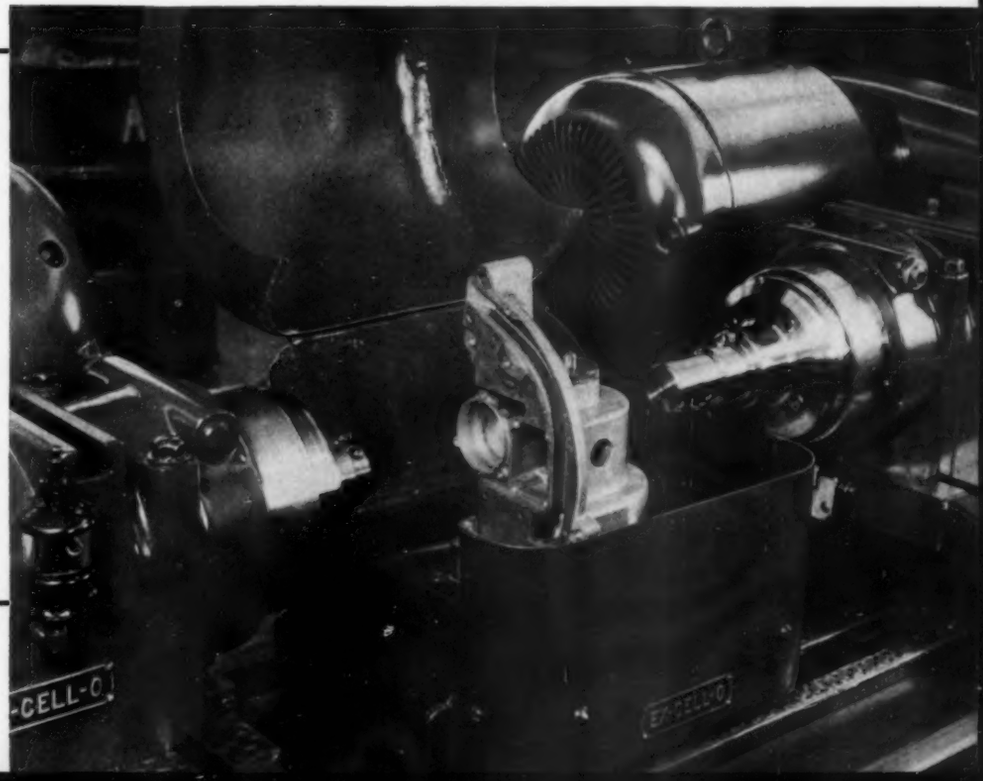


REAR HOUSINGS are bored, counterbored and faced on a single-end type precision boring machine equipped with a motor-driven spindle and cutter head on the bridge. A hand-operated work holding fixture is mounted on the table of this machine, the fixture being interchangeable with others of the same type for the different housings. In this fixture the housing is located on V-blocks, and is held by a gate clamp which has an equalizer bar. Holes 4.030 in. and 1.180 in. in diameter are bored, a 4.375 in. diameter is counterbored, and a 7⅞ in. diameter face is swept in one setting of the work. A limit of 0.0005 in. is held consistently on the 1.180 in. bearing hole.




FRONT HOUSINGS are bored and faced on a double-end machine. This unit has a bridge and individually motor-driven spindle at each end, with two interchangeable fixtures designed for mounting on the table. Here, the machine is set-up for finish boring and counterboring 2 in. diameter worm gear bearing holes, and the facing of the mounting pad on the front housing. The part is located on a die-cast hole over two locating plugs. It is held for machining by equalizing plunger clamp having a bayonet groove. This clamp is operated by a handwheel. Holes on each side of the part are bored in line and faced in one set-up, the table moving from one end of the machine to the other in an automatic cycle. Single-point tools are used.

AFTER A LOT of 2,000 pieces has been machined in the previous set-up, the fixture shown is mounted on the table of the double-end machine for finish boring and facing $2\frac{13}{16}$ in. diameter shaft bearing holes. The part is located in the fixture from a previously bored hole and clamped by means of a C-washer, so that both operations can be performed in one setting of the part. Limits of 0.0005 in. are held for the size of the bored holes in these front housings and, accuracy of bearing alignment is assured because parts are bored from each end in one set-up. An hourly production of 30 completely machined parts (four operations) represents a 700 per cent production increase.



# Cutting Steel With Carbide

**Tools designed according to the following data are recommended for use when steel is to be machined with Carboloy-tipped tools**

By JAMES R. LONGWELL
*Chief Engineer, Carboloy Company*

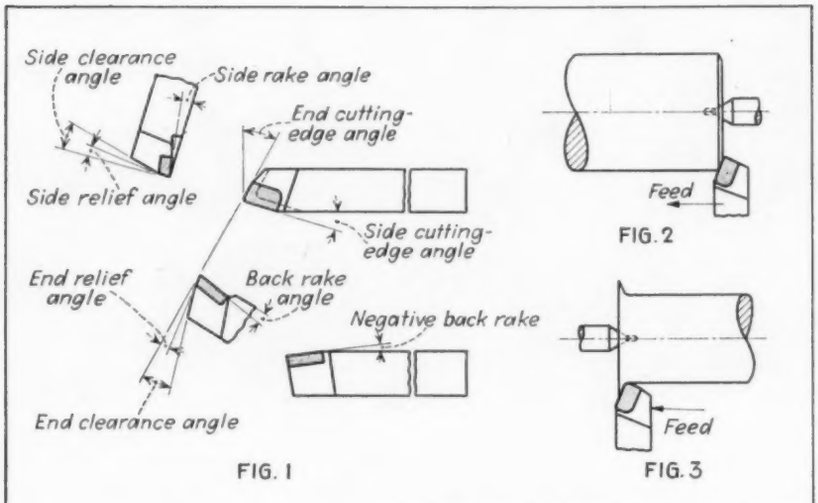



FIG. 1




FIG. 2




FIG. 3

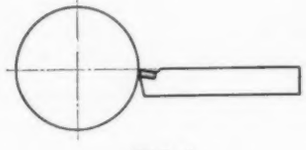


FIG. 4

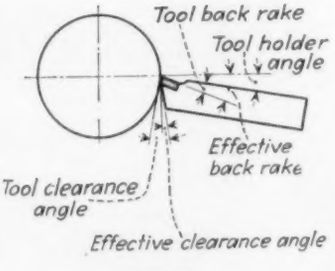



FIG. 5

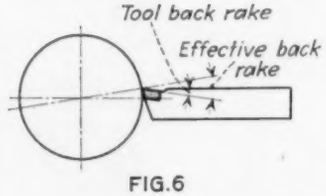



FIG. 6

*Fig. 1—Approved by the Sectional Committee on Small Tools and Machine Tool Elements under A.S.A. procedure, the above nomenclature is used for single-point tool elements throughout this article*

*Fig. 2—A side cutting-edge angle of 5 to 20 deg. on a single-point tool locates the starting load at a point back of the nose where the tool is stronger*

*Fig. 3—When leaving the work, gradual reduction of the cutting load, caused by the side cutting-edge angle, eliminates the familiar "hoop" produced by a straight tool*

*Fig. 4—Tool rake angles given in the text apply when the tool shank is perpendicular to the work at the point of contact. Figs. 5 and 6—Effective rake angles must be considered where the tool shank is held at an angle with a line drawn between the center of the work and the point of tool contact*

SOON AFTER the introduction of Carboloy cemented carbides in 1928, it became apparent that a distinction must be made between its use for cutting cast iron and non-ferrous metals, and for the machining of steels. The two groups have been the subjects of two separate lines of development during the ensuing period. For the past few years the problems incident to the machining of various steels with Carboloy-tipped tools have been given particular attention. As a result of recent studies, the following general recommendations can be made for the design of such tools.

The tool shape, as defined by the side cutting-edge or lead angle, the nose radius and the end cutting-edge angle (Fig. 1), ties in directly with the rake angles to determine the ability of the tool to remove metal efficiently. A suitable side cutting-edge angle provides two principal advantages: (1) when entering the work, the starting load is taken on the tip at a point back of the nose where the tool is stronger, as in Fig. 2, and (2) when leaving the work, Fig. 3, the gradual reduction of the cutting load eliminates the pushing off of a ring or hoop which may damage the cutting edge, especially on large diameter work. For most steel cutting, a side cutting-edge angle of 5 to 20 deg. is recommended. The job may be started with a side cutting-edge angle of 10 deg. when possible and increasing or decreasing the angle as individual conditions require.

To obtain maximum efficiency when machining steel with Carboloy, the point of contact should be held at a minimum. A large nose radius creates an excessive drag and reduces tool life. Start with a $\frac{1}{32}$ in. nose radius and, if necessary, increase or decrease the radius to suit the individual operation. For ordinary work start with a 15 deg. end cutting-edge

angle; increase this angle to 30 deg. on jobs where the tool plunges into the work at the start of the cut.

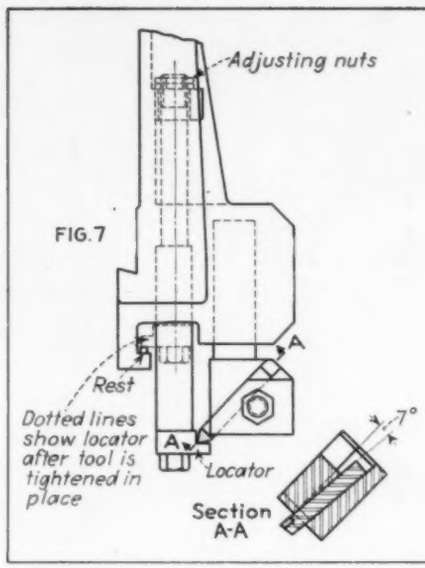
For turning steels containing less than 0.40 carbon, use a back rake angle of 0 to 15 deg. and a side rake angle of 8 to 15 deg. Where the steel has a higher carbon content, use a back rake of 0 to 10 deg. and a side rake of 8 to 15 deg. In both cases, start with the first angles listed. A negative back rake usually is advisable on planer and shaper tools. Start with 8 deg. negative back rake, using 2 to 5 deg. more side rake than the negative back rake.

By selecting the proper rake angles it is possible to obtain a tool that cuts freely, thus promoting long tool life. On some applications, however, it is not practical to use a truly free-cutting tool because it may not be possible to break the chip with such a tool. For this reason, there can be no hard and fast rule governing the selection of rake angles; they must be adapted to the needs of the individual application. On some intermittent cuts a negative back rake is advisable.

The tool rake angles suggested above are intended to apply to jobs where the tool shank is set perpendicular to the work at the point where the nose of the tool contacts the work, as in Fig. 4. In those set-ups, Figs. 5 and 6, where the tool shank is held at an angle with the line drawn between the center of the work and the point of tool contact, the rake and clearance angles on the tool should be changed to obtain the correct effective angles. In this connection, it should be remembered that whenever the top of a tool is ground, thereby changing the angle between the center of the work and the tool contact point, the tool rake angle should be changed to maintain the original effective rake; otherwise the tool must be shimmed up to position.

In order to provide maximum support for the cutting edge, clearance angles should not be greater than are required for free cutting action. For steels containing 0.30 carbon or less, use 8 to 12 deg. end clearance. If the carbon content is above 0.35 per cent, use an end clearance angle of 8 to 10 deg. Start with 8 deg. in each case. As in the case of rake angles, the effective or cutting clearance angles are affected by the setting of the tool. Proper consideration must be given to this problem when designing the tool.

Since steels have much higher tensile strengths than cast irons or the non-ferrous materials, the cutting load exerted on the tool is correspondingly greater when a steel is to be cut. It is desirable that both the shank height and tip thickness be greater than for a plain cast iron job.



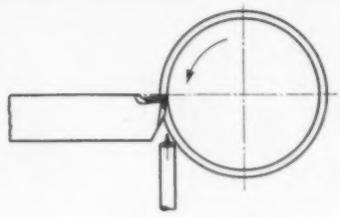



FIG.8

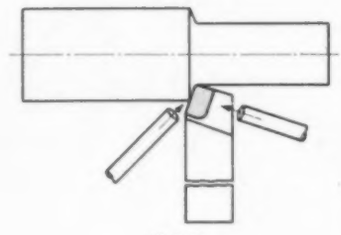


FIG.9

*Fig. 7—Locators which can be swung out of the way are time savers, especially when setting up jobs requiring a number of single-point tools*

*Figs. 8 and 9—Coolant should be directed under pressure from beneath the tool, or from each side, so that the rapidly forming chip will not prevent the stream from reaching the cutting edge*

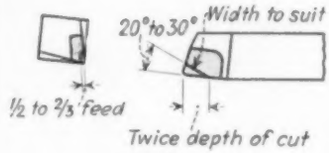


FIG.10

*Fig. 10—Chip breaking or curling grooves ground in the face of the tool tip frequently are sufficient. This design is recommended for general use*

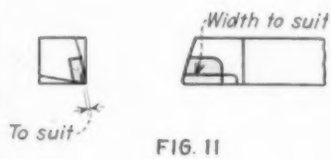


FIG. 11

*Fig. 11—When cuts extend to a shoulder, this ground-in chip curler has been used to advantage. Fig. 12—A small groove is recommended for light, fast finishing cuts*

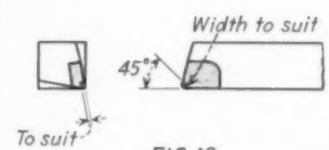


FIG.12

## Foot Holders

To obtain maximum production per man hour, tool holders should be designed to permit quick, accurate tool setting. Two factors to be considered in holder design are (1) the ability quickly to set the tool nose with relation to the work, and (2) the need to hold the tool at the desired rake angle. On many types of machines, holders can be designed to include locators which enable the operator to set the tools accurately for the desired work size, and to incorporate the rake angles in the tool slots. The latter feature often eliminates the need for using shims to obtain proper tool height, and frequently makes it possible to use one shape of tool at several positions in the tool set-up. A type of locator especially adapted for Bullard "Mult-Au-Matics" is shown in Fig. 7. The locator head in this unit can be turned and lifted out of the way after use.

As the Carboloy tip usually is brazed to a relatively soft shank, as compared with a high-speed steel tool, dog point screws should be used to hold the tool in position in the holder. If dog point screws are not available, cup point screws can be used if they are ground so that the end is flat and square with the threads.

Coolants increase tipped-tool life

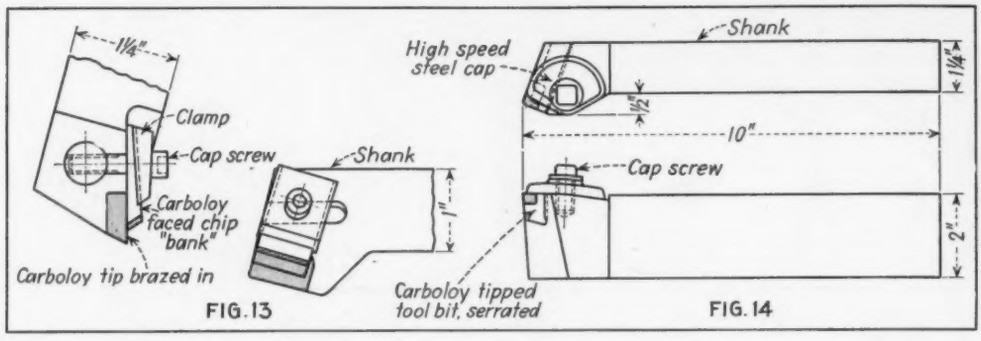



*Fig. 13—A brazed-in Carboloy tool tip and a Carboloy-faced breaker are employed on this tool to insure rapid turning with proper chip control. Fig. 14—A high-speed steel breaker is clamped above the tool bit in this tool*

## Speeds, Feeds and Tool Angles for Carboloy Tools

### FOR AVERAGE WORK AND QUANTITY PRODUCTION

| Bold face figures indicate starting suggestions. Data applies only up to 400 Brinell hardness, for harder steels start at one-half the speed shown. | | Cut | Feed | Cut | Feed | Cut | Feed | Cut | Feed | Tool Angles (See Text) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1/8 to 1/4 | 1/32 Max. | 1/16 to 1/8 | 1/32 Max. | 1/32 to 1/16 | 0.020 Max. | 1/64 to 1/32 | 0.010 Max. | | | | |
| | | F.P.M. | Grade | F.P.M. | Grade | F.P.M. | Grade | F.P.M. | Grade | Front Clearance | Side Clearance | Back Rake | Side Rake |
| Carbon | S.A.E. 1010–1025 | 150–350 **300** | 78A 78 | 200–600 **400** | 78A 78 | 300–800 **600** | 78 831A | 500–1800 **600** | 78 831A | 6–12 **8** | 6–12 **8** | 6–15 **6** | 8–15 **10** |
| | S.A.E. 1030–1095 | 150–350 **275** | 78A 78 | 150–350 **275** | 78A 78 | 200–350 **275** | 78A 78 | 300–600 **400** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Free Cutting | S.A.E. 1112–1120 | 150–350 **300** | 78A 78 | 200–600 **400** | 78A 78 | 300–800 **600** | 78 831A | 500–1800 **600** | 78 831A | 6–12 **8** | 6–12 **8** | 0–15 **6** | 8–15 **10** |
| | S.A.E. X1314–X1340 | 150–350 **275** | 78A 78 | 150–350 **275** | 78A 78 | 200–350 **275** | 78 831A | 250–500 **350** | 78 831A | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Mn. | S.A.E. T1330–T1350 | 150–350 **275** | 78A 78 | 150–350 **275** | 78A 78 | 200–350 **275** | 78A 78 | 250–500 **350** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Nickel | S.A.E. 2015–2320 | 150–350 **300** | 78A 78 | 150–350 **300** | 78A 78 | 250–500 **300** | 78 831A | 400–600 **500** | 78 831A | 6–12 **8** | 6–12 **8** | 0–15 **6** | 8–15 **10** |
| | S.A.E. 2330–2350 | 150–350 **275** | 78A 78 | 150–350 **275** | 78A 78 | 200–350 **275** | 78A 78 | 250–500 **350** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Nickel Cr. | S.A.E. 3115–3130 | 150–350 **300** | 78A 78 | 150–350 **300** | 78A 78 | 250–500 **300** | 78 831A | 250–500 **350** | 78 831A | 6–12 **8** | 6–12 **8** | 0–15 **6** | 8–15 **10** |
| | S.A.E. 3135–3450 | 150–350 **275** | 78A 78 | 150–350 **275** | 78A 78 | 200–350 **275** | 78A 78 | 250–500 **350** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Mo. | S.A.E. 4130–4820 | 150–300 **250** | 78A 78 | 150–300 **250** | 78A 78 | 200–350 **275** | 78A 78 | 250–500 **350** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Cr. | S.A.E. 5120–52100 | 150–300 **250** | 78A 78 | 150–300 **250** | 78A 78 | 200–350 **250** | 78A 78 | 250–500 **350** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| Cr. V. | S.A.E. 6115–6195 | 150–300 **250** | 78A 78 | 150–300 **250** | 78A 78 | 200–350 **250** | 78A 78 | 250–500 **350** | 78A 78 | 6–10 **8** | 6–10 **8** | 0–10 **0** | 8–15 **8** |
| | CAST STEEL | 150–300 **250** | 77A 78A | 150–350 **275** | 78A 78 | 150–350 **275** | 78A 78 | 150–350 **300** | 78A 78 | 6–10 **6** | 6–10 **6** | 0–10 **0** | 6–10 **6** |

### FOR LARGE WORK ON HEAVY BORING MILLS AND LATHES

| Bold face figures indicate starting suggestions. Data applies only up to 400 Brinell hardness, for harder steels start at one-half the speed shown. | | Cut | Feed | Cut | Feed | Cut | Feed | Cut | Feed | Tool Angles (See Text) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1/2 to 3/4 | 3/32 Max. | 3/8 to 1/2 | 1/16 Max. | 1/4 to 3/8 | 3/64 Max. | 1/8 to 1/4 | 1/32 Max. | | | | |
| | | F.P.M. | Grade | F.P.M. | Grade | F.P.M. | Grade | F.P.M. | Grade | Front Clearance | Side Clearance | Back Rake | Side Rake |
| Carbon | S.A.E. 1010–1030 | 60–100 **80** | 55A 77B | 60–150 **100** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| | S.A.E. 1030–1095 | 40–80 **60** | 55A 77B | 60–150 **100** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Free Cutting | S.A.E. 1112–1120 | 60–100 **80** | 55A 77B | 60–150 **100** | 55A 77B | 150–350 **300** | 55A 78A | 150–350 **300** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| | S.A.E. X1314–X1340 | 30–60 **45** | 55A 77B | 30–60 **45** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Mn. | S.A.E. T1330–T1350 | 30–60 **45** | 55A 77B | 30–60 **45** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Nickel | S.A.E. 2015–2320 | 60–100 **80** | 55A 77B | 60–100 **80** | 55A 77B | 150–350 **300** | 55A 78A | 150–350 **300** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| | S.A.E. 2330–2350 | 40–80 **60** | 55A 77B | 40–80 **60** | 55A 77B | 150–250 **200** | 55A 78A | 150–250 **200** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Nickel Cr. | S.A.E. 3115–3130 | 40–80 **60** | 55A 77B | 40–80 **60** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| | S.A.E. 3135–3450 | 40–80 **60** | 55A 77B | 40–80 **60** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Mo. | S.A.E. 4130–4820 | 40–80 **60** | 55A 77B | 40–80 **60** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Cr. | S.A.E. 5120–52100 | 40–80 **60** | 55A 77B | 40–80 **60** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| Cr. V. | S.A.E. 6115–6195 | 40–80 **60** | 55A 77B | 40–80 **60** | 55A 77B | 150–300 **250** | 55A 78A | 150–300 **250** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |
| | CAST STEEL | 60–100 **80** | 55A 77B | 60–100 **80** | 55A 77B | 150–250 **200** | 55A 78A | 150–250 **200** | 55A 78A | 6–10 **6** | 6–10 **6** | 0–6 **0** | 6–10 **6** |

on all steel cutting jobs. Soluble oil has, in most cases, been found superior to other coolants for such applications. To assure effective cooling of the tool, the coolant pump, tank and piping should be of sufficiently large capacity to assure ample volume of coolant at the tool tip. Coolant should leave the nozzle under sufficient pressure to force it against the tool and the work. It should be directed so that the obstruction caused by the rapidly forming chip does not interfere with coolant flow. This can be accomplished by directing the coolant from below the tool, as in Fig. 8, or from each side of the tool as in Fig. 9. When set up as in Fig. 8, a large secondary end clearance angle should be provided to facilitate delivery of the coolant to the cutting edge of the tool.

### Chip Breaking

The high tensile strength of steel results in the production of continuous chips when machining operations are performed with tools of usual shapes. This continuous chip usually is obtained at speeds above 250 ft. per min. when Carboloy-tipped tools are used, and results in a problem of obtaining safe, economical chip disposal. Easy chip disposal requires that the continuous chip be broken into relatively short lengths which may be removed from the machine readily.

The ease with which the chip may be broken depends upon the chip cross-section and the physical characteristics of the steel being cut. A thin, springy chip is practically impossible to break, but it usually can be coiled. A thicker chip with some stiffness usually can be broken. Breaking characteristics of a given chip usually can be improved by rapid cooling with a heavy flow of coolant, and by increasing the feed to obtain a chip cross-section which breaks readily.

Two of the means by which chip control has been accomplished successfully are: (1) by using a ground-

in chip breaker to stress the chip to the breaking point, and (2) by using a mechanical chip breaker mounted above the tool tip to break the chip into short lengths. Types of ground-in chip curlers in common use are shown in Figs. 10, 11 and 12, while two mechanical chip breakers are shown in Figs. 13 and 14.

The breaker in Fig. 13 employs a brazed-in Carboloy tip and a Carboloy-faced breaker clamped on top of the tool in such a position that it acts to curl and stress the chip to the point of breakage. The second design uses a tool bit having a brazed-in Carboloy tip, the bit being held tight by serrations and a high-speed steel breaker. With both types of tools, the chip breaker readily can be adjusted to alter the distance between the breaker face and the cutting edge to take care of various depths of cut and feeds. Tools of the same general design as these two examples have been used successfully on cuts of more than $\frac{1}{16}$ in. depth.

Speeds for machining various types of steel with Carboloy tools are shown in the accompanying table. The speeds shown in boldface are those recommended when starting a job. These can be adjusted either way to suit conditions. Selection of the proper grade of Carboloy is necessary for best results. In the tables, the grade shown in bold face is suggested for average shop work.

When machining boiler plate and mild steel similar to S.A.E. 1010, or any steel below 0.20 carbon, experience indicates that, with a free cutting tool, performance usually is improved as the cutting speed is increased. When machining steels containing more than 0.20 carbon, try speeds both higher and lower than the starting speed until one is found which is best suited to the feed, depth of cut, hardness of the steel and other factors.

Selection of feed is governed by the machine and the operation. Size of tool, depth of cut, material to be machined and available horsepower must be considered. When ample power with no belt slippage is assured, start with 0.015 to 0.025 in. feed per revolution. If the power available is doubtful, try 0.010 to 0.015 in. feed per revolution. Should the machine stall for any reason, loosen the holding screws and remove the tool from the cut. Do not attempt to move the work or to back the tool out of the cut, or the tip may be broken.

As more power is required to machine steel than practically all cast irons and non-ferrous materials, the power available should be checked carefully. Sufficient power *must* be provided before attempting to use carbide tools. Tables and formulas have been developed for calculating the power required by a given operation. Be sure to check all clutch parts and clutch fingers for proper adjustment to prevent slipping and stalling. When using a belt-driven machine, be sure that proper width belts and pulleys are used.

At the higher speeds used with carbide tools it is necessary to have room to handle the increased volume of chips. This is an especially important consideration on multiple-tool set ups, as the additional chip handling problems at higher speeds sometimes will more than offset the time saved on a machining operation.

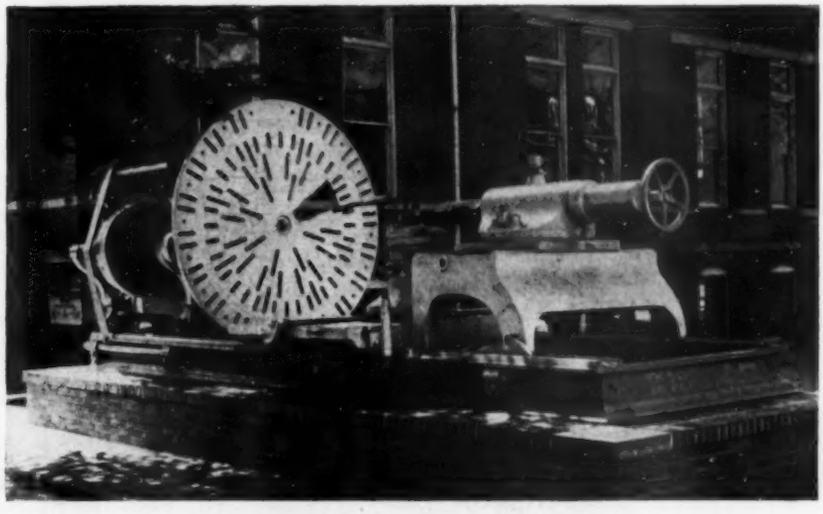
Frequently the machine to be used lacks sufficient opening in the bed and around the tool holders or blocks to allow the chips to get away. It usually is impossible to enlarge the opening in the bed, but much can be accomplished by employing sheet metal chutes to eliminate pockets and slots where chips are apt to clog.

# A Lathe With a History

ON THE CAMPUS of the Alabama Polytechnic Institute, Auburn, Ala., is the lathe illustrated herewith. It is attractively mounted adjoining the School of Mechanical Engineering and it has a most interesting history.

While we have been unable to find many details of its manufacture, we are informed by Prof. Charles R. Hixon that it was presented to the Institute by the Tennessee Coal, Iron & Railroad Company on January 27, 1937. This is an old machine that was used in making cannon in the Confederate arsenal in Selma, Ala., during the war between the states. When the Federal army was operating near Selma it was feared that the lathe would be captured and it was loaded on ox-teams and headed toward Columbus, Ga. The pursuit was so threatening, however, that the lathe was unloaded and buried not far from Tuscaloosa, Ala. As the lathe weighs 28,000 lbs. it must have been difficult to handle, especially on the roads then in use.

Here it remained buried until the close of the war when it was sold to the Tennessee Coal, Iron & Railroad Co. and taken to Columbus, Ga., and later to their shops in Birmingham, Ala. This undoubtedly dates the lathe back in the 1850's or earlier, but unfortunately gives no hint as to who built it. The design of the bed gives some idea of the size of the lathe which has a face plate approximately 60 in. in diameter. The driving and feeding mechanisms are similar to other lathes of the same period. The hole in the face plate was probably cut to permit the crankpin of locomotive driving wheels to project through the plate.



*Used in a Confederate arsenal during the Civil War, this lathe was buried to prevent capture by Federal troops. A railroad shop used it until 1937*

# Lowdown on the Showdown

**It is demoralizing and involves sabotage. It constitutes fraud. For proof read this account of Chrysler's experience. Its use raises some pertinent questions**

AFTER THE RASH of sitdown strikes in 1937, public opinion crystallized against them and they were abandoned. They were dumped overboard because they were vicious, destructive, intimidating and valueless in arriving at an equitable solution of a labor dispute. Even certain labor leaders condemned them.

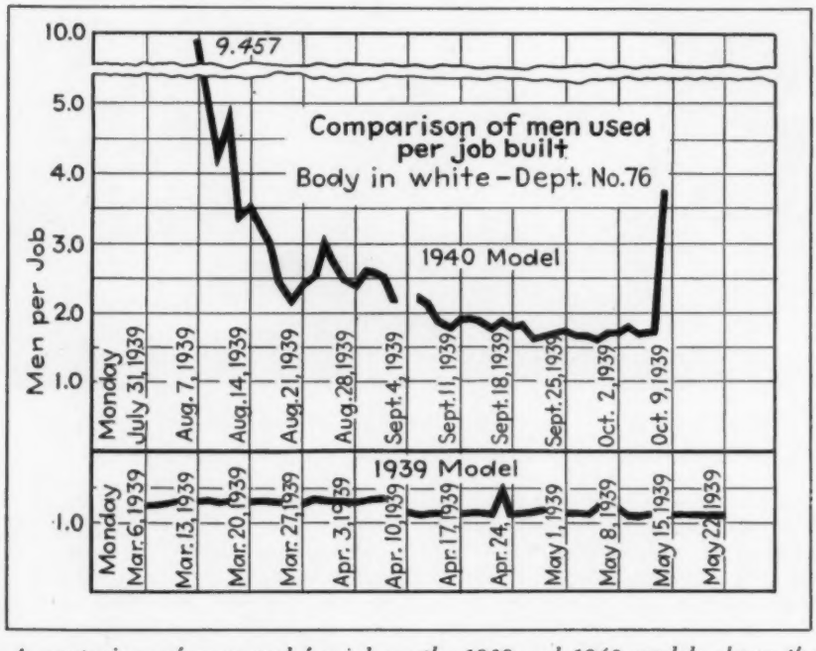
They have been succeeded, however, by an even more demoralizing technique—the slowdown. Not as spectacular in some respects as the sitdown, the slowdown is even more insidious. Men pretend to work. At first, output is curtailed in key departments. Then if the management still refuses union demands, the slowdown is intensified to the point that the plant no longer can operate. A cry of "lockout" may be raised, because government officials and the public cannot truly appraise the situation in its early stages.

The slowdown involves something else—sabotage. What else can you call a technique which has the worker deliberately let parts or assemblies go through his department either untouched or half-finished? It is a procedure which completely disrupts production schedules and eventually results in chaos in a factory.

Still another charge can be made against the slowdown. It is an attempt to defraud the management. How else can one regard acceptance of full wages for an extended period during which no attempt is made to live up to the usual work standards?

Labor leaders conducting a slowdown possess one big advantage which the sitdown does not give them. The sitdown strike is an illegal work stoppage recognized as ground for withholding unemployment compensation. But a slowdown isn't. By clever maneuvers slowdown leaders can so muddle public opinion that it isn't sure whether employees are thrown on the streets by a work stoppage or by a lockout.

Should a State unemployment compensation commission be undecided in its policy, a hue and cry may be raised by workers which political expediency makes it unwise to ignore. In some States, such as Michigan, the law governing disqualification of workers for unemployment compensation for taking part in a work stoppage gives wide latitude to the commission. Unless substantial proof is shown that an automobile worker is disqualified, he receives about $15 a week. Thus a strike may be partly financed by getting a goodly number of men on relief rolls for the duration of the controversy.




*A comparison of men used for job on the 1939 and 1940 models shows the sudden rise in manpower required caused by the slowdown*

### The Way It Works

How is a slowdown organized? How are the vulnerable points singled out for attack? How is the actual slowdown geared in with the point of attack? What are the net effects upon manufacture?

An automobile manufacturer is probably the best example of closely integrated purchasing, manufacturing and assembly operations. Materials and parts supplied by vendors move to the point of consumption on a carefully calculated schedule. Manufacture of parts and assemblies in the plant itself likewise keeps pace with consumption, with only nominal provision for finished stocks. Adequate supplies must be maintained but inventories are not allowed to get out of step with production because of the great sums of money involved. Thus, the vendor, his labor, and all labor in the auto plant's manufacturing departments are directly interested in what happens on the final assembly line. The rate of production there is what will determine their own production and hours of labor in the last analysis.

Obviously production sabotage will

start at a key point in the automobile production system. It won't start in connection with parts, because a dozen vendors may be able to supply deficiencies. Moreover, considerable banks of motors, transmissions, axles and other sub-assemblies of moderate size are often maintained. A slowdown here would take time to become effective.

But a vulnerable spot is the body department. For instance, each chassis coming down the assembly line must have a body. Bodies are huge in size compared with the stampings from which they are made. An hour's production requires considerable storage space. To have enough space to store even a single day's run is too costly. Hence all car makers must gear production closely to the needs of the final assembly line. Of necessity the final assembly line is geared to the body department's output. The two are interlocked.

### Stoppage Where It Hurts

Bodies are produced in three departments, which again are interlocked. These are: (1) the body-in-white department where body stampings are assembled by gun welding the components together while clamped in framing jigs, (2) the paint department, and (3) the trim department. Bodies taken from the framing jigs move on conveyors to the "body transfer," thence to the final assembly line.

The body transfer is the heart of the system. A separate chassis assembly line feeds to the final assembly line. A feeder line supplies an assembly consisting of the two front fenders and the radiator shell. At this

## CASE STUDIES OF PRODUCTION SABOTAGE

### I. BODY IN WHITE AT DODGE — SEDAN MODEL

*Operation:* Assembly of major body sub-assemblies.

*Equipment:* Three framing jigs by which the body is built up progressively as the sub-assemblies are added and spot welded together.

*Comparison of setups and production in 1939 and 1940:*

| | *1939* | *1940* | *1940 compared with 1939* |
|---|---|---|---|
| Weight of body | 514 | 538 | 5.4% increase |
| Number of men employed | 11 | 11 | Same |
| Clamps required to hold job for welding | 79 | 67 | 15% fewer |
| Welding guns required | 16 | 14 | 12½% fewer |
| Spot welds to make | 699 | 642 | 8.2% fewer |
| Production required per hour | 12 | 12 | No change |
| Jobs produced per hour | 12 | 8.5 | 29% loss |

*Workers Attitude on 1939 Model:* The eleven men in a team worked in unison on a set of three framing jobs. Work flowed smoothly from one jig to the next.

*Method of Sabotage on 1940 model:* Operators stalled at say No. 2 jig long enough to keep operators waiting at the next station. Operators at prior station were required to stand idle until their jig could be unloaded. The method was easily varied.

*Remarks:* With no decrease in manpower, and with appreciable reduction in clamps, number of guns to handle and welds to make, these men could have produced at least 14 instead of 8.5 bodies if they had exerted the same effort in 1940 as in 1939. The 5.4 per cent increase in total weight of the body works no hardship on the operators because the additional 28 lb. is divided up among several components.

Sufficient manpower was provided in the department to produce 1,536 bodies daily. At no time prior to Oct. 6 did the daily output surpass 1,300 bodies, indicating a loss in production efficiency in the plant of at least 15 per cent and frequently more, and without considering the influence of slowdowns further along the line. Without any interference in production elsewhere, a slowdown in framing bodies affects the hourly rate of production of approximately 7,000 people.

### II. WET SANDING OF BODIES — DODGE

*Equipment:* At the beginning of the 1940-model production season, power-driven machines were introduced for wet sanding the large surfaces of the body, such as top, side panels and doors. Window openings and reveals were to be sanded by hand as before.

Machine sanding had been used during the 1939 model season by an outside manufacturer without incident. On the other hand, Dodge and Kercheval workers had refused to permit power equipment on this operation. So before the 1940 model season got under way, production studies were made to determine how much labor should be used with a combination of hand and machine methods. More manpower was supplied per body than used by the other manufacturer.

Although machines reduced the effort required to sand the large body surfaces, the men demanded that more operators be employed with the new setup than had been used when sanding was done entirely by hand! There was no objection to continuing the use of machines provided that more union men were put on the payroll. Refusal to consider such a preposterous suggestion brought the slowdown as the figures below will show.

*Comparison of 1939 and 1940 wet-sanding setups and production:*

| | *1939* | *1940* | *1940 compared with 1939* |
|---|---|---|---|
| Surface to be sanded, sq. ft. | 146.6 | 145.6 | One sq. ft. reduction |
| Number of men: | 28 | 26 | 7.9% decrease |
| Hand sanders | 28 | 13 | |
| Machine sanders | — | 13 | |
| Production required per hour | 33 | 36 | 9.0% increase |
| Bodies per man per hour | 1.18 | 1.38 | 1/6 body more per hour |
| Production obtained per hour | 33 | 27* | |

*When the rated output of 36 bodies per hour was reached, production was cut immediately by 25 per cent. On Oct. 6, the production was cut 75 per cent.

*Workers Attitude on 1939 Model:* Although refusing to permit introduction of machine sanders, the operators raised no objection to production of 1.18 body per hour per worker by hand methods.

*Methods of Sabotage on 1940 Model:* Despite introduction of equipment that removed much of the harder labor on large surfaces, and left only the easier jobs to be done by hand, the first stages of the slowdown took two courses: (1) letting every fourth body go by untouched, or (2) permitting a partially sanded body to leave the line. In either case, the body had to be trucked back to the starting point and done over again.

Later on the operators, making no pretense of working, skipped every fourth body and finally on every second one. They stood back from the line and watched untouched work go by. The presence of supervisors made no difference.

*Effects upon the remainder of the plant:* Paint spray and trim operations could not proceed faster than the wet-sanding department. Final assembly operations were curtailed, together with all feeder lines operating in timed sequence.

point the chassis becomes identified as a portion of a definite order.

Naturally it is necessary to obtain the correct body for the chassis, because each car is a definite entity involving certain individual specifications for color, trim, fittings, etc. An operator on the final assembly line advises the body transfer by telautograph that chassis A256 is coming down the line and to be ready to drop body A256 on as the chassis goes by. Under normal conditions the production control system has seen to it that body A256 is complete and ready in the body transfer bank. Mixups are a rare occurrence.

Failure to get bodies in adequate number and in correct order puts an immediate brake on the final assembly line, and affects the whole plant. Motor, axle, fender and radiator shell assembly lines are affected. They suffer interruptions during the shift or must run short time in order not to swamp the plant. The chassis and final assembly lines must work short hours, being governed by the day's rate of output in the body department plus the few bodies accumulated while these lines were not running on the previous shift.

These are the reasons why the body department offers a vulnerable point of attack for a slowdown in an automobile factory. How is a slowdown actually put into operation and what are its net effects upon production?

It is now a matter of record that Chrysler Corporation plants were recently forced to close because slowdowns had crippled the Dodge main plant. From the earliest stages of the slowdown, the body department bore the brunt of the union's tactics. Case studies made by the Chrysler management are presented for the body framing and wet sanding operations, comparing the job, equipment, manpower supplied and production obtained during the 1939 and 1940 model seasons.

Simple stalling on the framing jigs and outright skipping of perhaps every fourth body during painting and trimming caused the Dodge main plant to suffer a production loss of over 7,000 bodies during the four-week period September 11–October 6. Scheduled output was 1,536 bodies daily, but the maximum obtained never exceeded 1,300 units. This loss was aggravated by the fact that the company had to provide as many as 67 per cent extra repairmen over normal to complete the jobs ignored or partially completed by the regular crews. An accompanying chart shows that the slowdown technique is costly to the manufacturer. It compares the number of men per body under normal and slowdown conditions in the body-in-white department.

A typical daily production report, for October 6, shows that the body-in-white, paint and trim departments operated at less than 70 per cent of efficiency. These three departments enjoyed repairmen over the allowable standard of as much as 60 per cent. Extra repairmen on the final assembly line operated at strategic points to catch any jobs that were not completed before the body passed the transfer point.

On October 6 the C.I.O. union intensified the slowdown strike because the corporation disciplined some of the slowdown strikers. Production dropped 50 per cent in 25 out of 28 manufacturing and assembly departments in the plant alone. Over 94 per cent of the productive personnel of 18,000 men at that plant were employed in the affected departments. The confusion became so great that regular production could not be maintained and the management had to cease operation shortly after each shift began. After each shift, the management straightened out the confusion so the next shift could work if it wished but the men were not allowed to do that by the union. This kind of a strike against production is obviously demoralizing and vicious.

Use of the slowdown technique at Chrysler, which may foreshadow its general use by organized labor to achieve its own ends, raises some pertinent questions:

1. Does not the fact that men who remain in a plant but refuse to work at well established rates of production constitute an illegal seizure of property?
2. Who is operating a plant, the legally constituted management or the union, when its production fluctuates up or down at the will of union leaders?
3. Is a manufacturer to suffer production losses and to pay out wages for work not done, and at the same time have no redress?
4. Is not the slowdown an overt act of intimidation and coercion?
5. Should workers in dependent departments be forced to work part-time and perhaps eventually have to stop work altogether because a slowdown is ordered by the union in a vulnerable department?

# The Jerry Coffin Case

By H. M. LANE

Early in the '80s, Professor John Sweet was in charge of Sibley College at Cornell University. There was a bright young man in college at that time by the name of Jerry Coffin. He roomed with a boy by the name of Smith, who many years later became the head of Sibley College. Jerry, while in college, invented what was then known as the Coffin averaging instrument, which is now sold under the name of planimeter.

Dean Smith frequently told me of the way Jerry worked it out. He first studied it from the mathematical standpoint, and then he drilled a hole in the center of a penny to serve as his measuring wheel; he made a frame of wood, fastened together with pins, and started to running the pointer around various figures of known area. The instrument was put into manufacture in a short time.

When Coffin came to the end of the course, he passed his mathematics and all engineering studies with flying colors, but he could not spell. The engineering department wanted to graduate him, but the English department said "No" and meant it.

Jerry went away without his sheepskin, and at Homestead, Pennsylvania, did some brilliant work in connection with the manufacture and testing of steel. Unfortunately, after the Johnstown flood, there was an epidemic of typhoid, which claimed as one of its victims, Jerry Coffin.

At the same time, there was at Cornell a student known as Jerry Flathers. He was later Professor of Engineering at Lehigh University, then at Purdue University, and still later, at the University of Minnesota. Flathers was very much impressed by the Coffin case. Later, when I was a student at Purdue and he was professor of mechanical engineering, I came up for graduation in 1892. Like Jerry Coffin, I can spell any four-lettered word in at least four ways, and I am not sure which one is correct. Again, as at Cornell, the English Department set down its foot and said I could not graduate, but Jerry Flathers led a successful fight in the faculty, which finally gave me my sheepskin, and some years later my advanced degree.

# Low-Cost Tools For Limited Production

**Small shops, new industries, and concerns starting to manufacture new products can find uses for these specially selected examples of low-cost press tools**

By C. W. HINMAN
*Tool Engineer*
*Kobzy Tool & Electric Mfg. Company*

RADIO SETS, electric refrigerators, domestic stokers, air-conditioning units and many other products have passed through stages where their manufacturers needed low-cost tooling because many design changes were involved. This process of evolution is going on continually in many lines, and the tool engineers responsible must be familiar with the principles of designing satisfactorily low-cost or temporary tooling, as well as the high-production types that come later. And small shops have need continually for cheap tools that will not be an excessive burden on small-lot orders. The examples given here for progressive piercing, forming and cutting-off tools, for adjustable die holders, for an automatic stop, and tools to be used in vise or shaper are all practical examples of principles that have given good accounts of themselves in job-lot work.

Fig. 187, at *A*, shows a steel bracket to be pierced, cut off and formed with two angular ends, one piece per press stroke. The single-operation progressive die is shown in two views. The upper view shows the punch members ready to descend and cut-off, pierce and bend the ends of the work in opposite directions. In the lower view, the tool is completely closed, and all the operations have been finished. Such tools are built in a great variety of designs for rapidly producing such small articles as radio parts, telephone switch-board braces, and brackets for assembling furniture.

The strip is fed through a channel stripper plate *B*, and across the face of the piercing and cutting-off die *C*. The left end of the strip registers

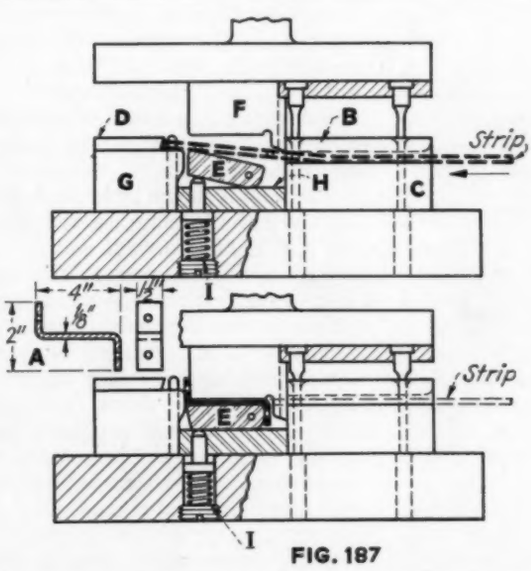



FIG. 187

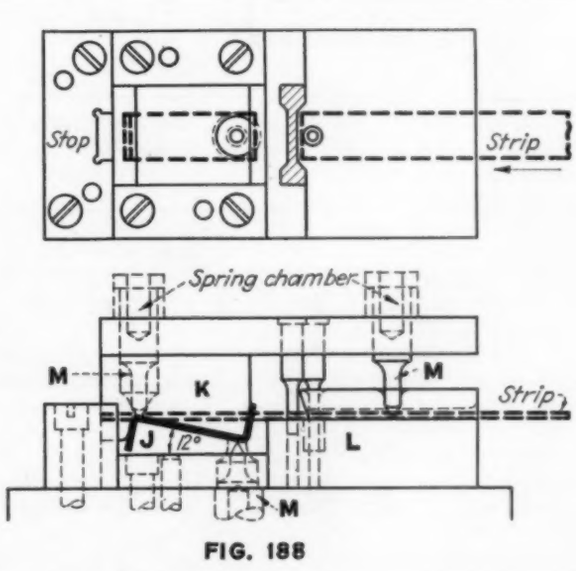



FIG. 188

*Fig. 187—In this progressive die, the blank is confined between C and D, so that the bends are located accurately. Fig. 188—In contrast to Fig. 187, the cut blank is prevented from creeping by three pins actuated by compression springs*

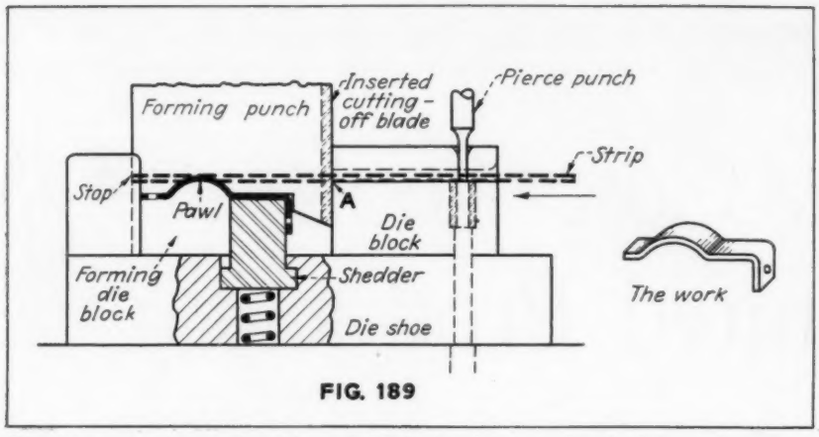



FIG. 189

*Fig. 189—An inserted cutting-off blade is often a valuable feature because it can be lowered after grinding the angular edge*

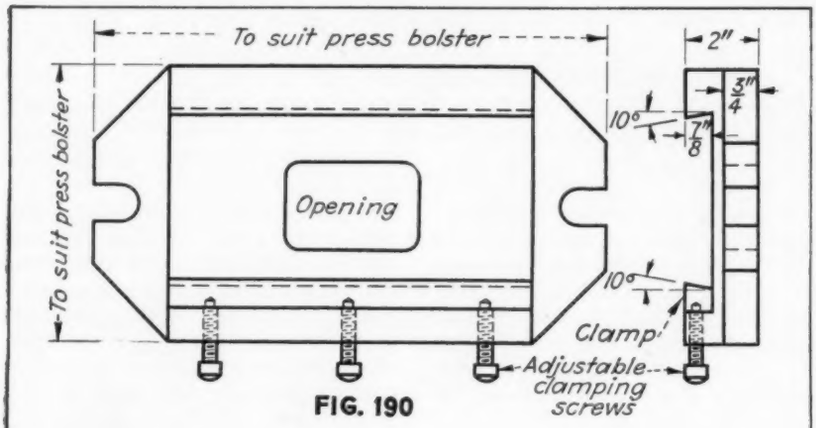



FIG. 190

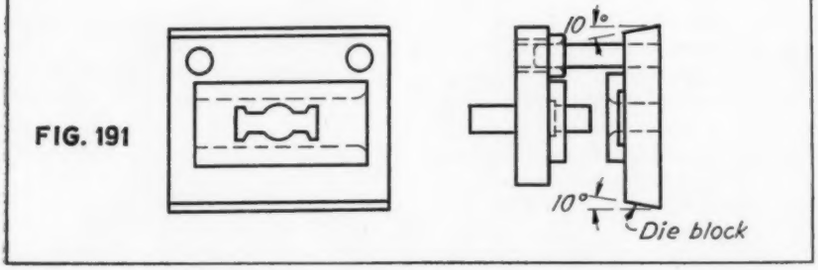



FIG. 191

*Figs. 190–191—About three dozen adjustable die holders will be found sufficient for mounting as many as three hundred temporary dies as they are required in the shop*

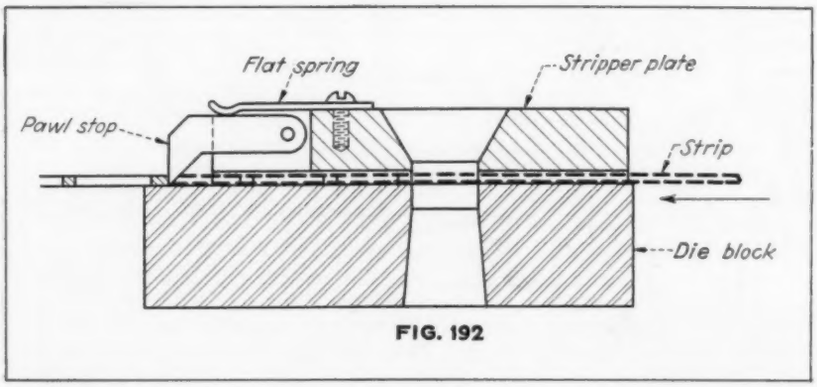



FIG. 192

*Fig. 192—Grinding or peening the point face of this pawl-type automatic stop will alter the blanking length when necessary*

against stop *D*, and is positioned over the pivoted forming block *E*. The strip then lies at a 10-deg. angle with the horizontal. When the ram descends, punch *F* severs the blank from the strip. Continuing in descent, the punch forms the piece against block *G* and over the right end of pivot block *E*. Block *E* is supported at all times in the bottom of its confining channel *H*. When the ram ascends, the work is ejected by the pull of the punch and the elevating action of spring *I* on block *E*.

### An Alternate Design

A die of different design for producing a similar piece is shown in Fig. 188. This tool uses a positive bending die block *J*. The finished work lies between the closed forming punch *K* and block *J*, at an angle of 12 deg. with the horizontal. The high point of bending die *J* is in the same horizontal plane as the top surface of die block *L* to facilitate feeding the strip. When the punches ascend, the work slides off the rear of the die, because the press is tilted.

When grinding the surfaces of cutting die blocks in tools of such designs, a like amount of metal is ground from the undersides of the forming blocks in order to maintain the tool members at the same heights.

A third die, Fig. 189, indicates the large range and simplicity of these piercing, cutting-off and bending tools. The punch cuts off the strip with an inserted blade. Cutting occurs on the die-block edge at *A*. Continuing in descent, the punch forms the arc in the work, and simultaneously carries the blank down against the spring shedder, forms down the angle, and then registers the shedder in the die shoe at completion of the down stroke. The piece is now completely finished as shown between the punch and die. A spring shedder ejects the work.

The strip is shown by heavy dashed lines over the forming die and across the punch. Its forward end is registered against a stop at the left. This is the first position of the strip before the ram descends.

Tool costs are reduced by using the substantial die holder shown in Fig. 190. Small shops favor this design. The material is either a steel casting or forging. There are times when cheap and convenient press tool equipment is wanted and this die holder, together with its corresponding die, shown in Fig. 191, are suitable designs. For still cheaper equipment, the guide posts can be omitted from the die.

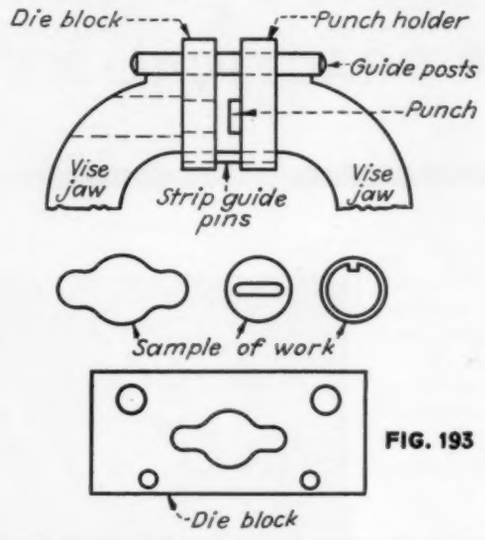



FIG. 193

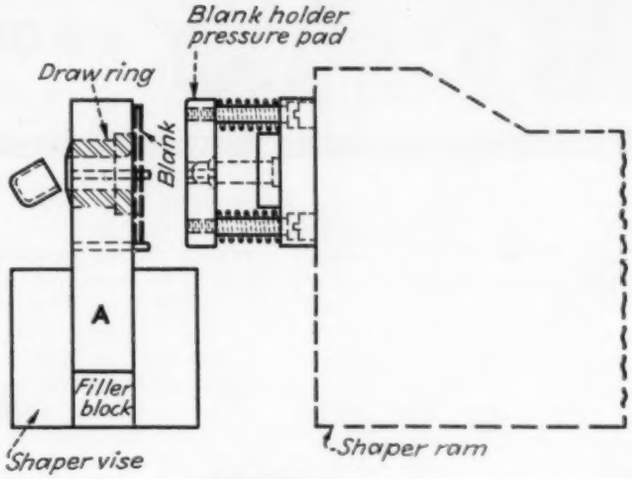



FIG. 194

*Fig. 193—A bench vise often provides the means of making quantities of small parts from 1/32–1/16 in. brass stock. Fig. 194—A shaper is a convenient machine upon which to set-up several types of press tools for simple die operations*

The set-up of this equipment is obvious from the sketches. The die can be clamped in the holder and positioned centrally. In operation, the tool is handled the same as if built into a conventional die set.

Several advantages are obtained from using this type of equipment. About three dozen of these adjustable die holders will take care of the output from several hundred dies. It is seldom necessary to remove the die holder from the press. The press tool is light and easy to construct and handle. Only about three widths of the dovetail-shaped die sections are required for each press size. The several cross-section widths are machine finished in lengths on a planer, and then stocked. The stockkeeper can cut off any required length for a new die block. Such tools as these require a minimum of storage space. Roughly estimated, they require about half the space of similar tools which are mounted in conventional die sets.

### Cheap Tools Easily Changed

Before a new product has become standardized, innumerable changes in apparatus designs are always necessary. It is therefore a good policy to begin production with low-cost temporary tools and with only one operation performed in each. Then these simple low-cost tools can be changed without much expense.

Temporary press tools are single-station blanking, piercing or forming dies without guide posts. A positive stripper plate can be used, or "skyhook" ejectors attached on thin die blocks which can be easily worked out. If piece part holes are necessary, the holes are drilled through unbushed pack-casehardened drilling jigs, instead of building expensive piercing dies. Each forming operation is performed in a separate die. Effective alterations can then be made quickly in any of the tools without interfering with the others.

### Pawl-Type Automatic Stop

A cheap and effective pawl-type automatic stop for blanking strip stock is shown in Fig. 192. This stop is easy to install and seldom needs attention or repair. It is operated by the movement of the strip, and is entirely independent of the punch movement. As implied by its name, this stop is simply a horizontal pawl secured on a fulcrum pin fixed in the stripper plate. Side clearance, needed in other stops to cause them to swing over the strip, is unnecessary.

The pawl lifts up against a flat spring, when the strip is fed under it, and its point drops into the next blanked opening. The operator then pulls the strip back slightly, until the left edge in the blanked opening registers against the point on the pawl. An operator soon becomes familiar with this rhythmic motion, and over 40,000 pieces of average blanks can be produced daily. Some press operators prefer using this stop rather than a swing stop. The pawl point is usually located outside the left edge of the stripper plate, in plain view, and in convenient position for repair.

Small shops can substitute a bench vise for a punch press. Large quantities of useful blanks, such as designation plates, badges, washers and tags, have been made from $\frac{1}{32}$–$\frac{1}{16}$-in. gage brass by this method. Fig. 193 shows the principle. The punch is sawed from $\frac{1}{4}$-in. ground tool-steel stock, and file finished. Then the punch is drilled for one holding screw and two small dowel pins, hardened and tempered and sheared into the die. The die is subsequently filed out to allow proper punch clearance. This die has no stripper plate. For small quantities of blanks, the stock is stripped from the punch with a fork-shaped hand tool. For larger quantities, an open-side stripper plate is attached on the die, and the punch is made suitably longer.

### Press Tools in a Shaper

Several types of press tools can be operated successfully in an ordinary shaper. A shaper, with its ram, vise and multitudinous adjustments, can be considered another type of horizontal drawing press. Fig. 194 represents a die for small brass shells.

Dies made for a shaper are very cheap and effective tools; the die holder *A* can be any suitable block of steel or cast iron picked up around the shop. No die sets are needed. The many quick adjustments on a shaper, that govern the length of stroke, ram speed, die space and vertical heights, are found convenient for many varieties of die work. Another advantage is found in using vertical magazines for feeding the work into the dies. For sizing, burnishing, or redrawing shells, the magazine principle works out well.

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*This is the last installment of Mr. Hinman's series on press tool design.*

# IDEAS FROM PRACTICAL MEN

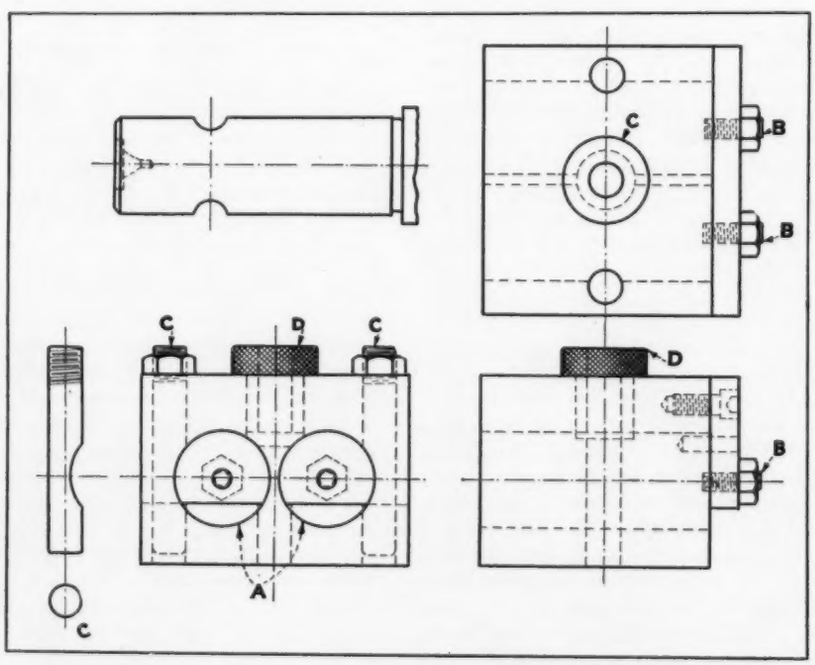
## Jig for Grooving Slip-Chuck Shanks

By C. H. HAYS

Since we make all the slip-chuck shanks used in our plant, it was necessary to devise some rapid means for machining the transverse grooves in their sides. Accordingly, the jig illustrated was made.

The jig body is bored at *A* to receive two shanks which are positioned endwise by the adjustable setscrews *B* and are held by the locking bolts *C*. Each locking bolt has a transverse groove on one side of the same radius as that of the shanks, and in which the shanks engage, so that tightening the locking bolts binds the shanks and holds them securely. The slip bushing *D* is one of two required, one for a drill and one for a reamer. A finished shank is shown at the upper left in the illustration.

In operation, two shanks are placed in the jig and the locking bolts are tightened. A drill through the bushing, followed by a reamer, machines a groove of the correct radius and depth in the facing sides of each shank. The shanks and the locking bolts are then removed, rotated 180 deg. and replaced. The plain parts of the locking bolts engage the grooves already made in the shanks and serve as keys to keep them in place. Since the grooves in the shanks are now diametrically opposite their former position, repeating the operation machines the second groove in each shank, completing the work.

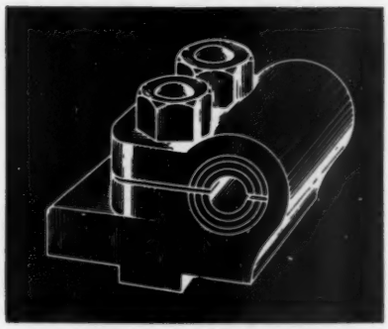



*A transverse groove is machined in two shanks at one setting. For machining the grooves, the shanks and the locking bolts are rotated 180 degrees*

## Holder for Boring Tools

By H. R. HAGEMAN

I am inclined to challenge the claim for rigidity in a holder for boring tools in which a spring collet is the holding medium, as described by Fay E. Clarke *(AM—Vol. 83, page 572)*. Owing to the fact that spring collets are counterbored from the back, leaving but ¾ in. or less bearing surface, a rod held therein for turning in a lathe can not project more than 2 or 3 in. without considerable chattering unless it has some auxiliary support. The effect is the same if the work revolves while the tool is held stationary.



*This holder equipped with split bushings will hold boring tools rigidly, eliminating chatter*

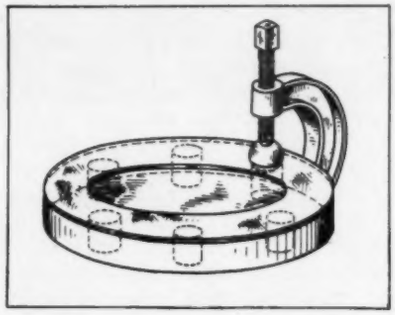
Believing that spring collets are designed for holding work concentrically rather than rigidity, I think it is poor practice to use them for any other purpose than that for which they are intended, because of the ever present temptation to tighten the nut or the draw-in sleeve too much, thus straining the threads and rendering both threaded parts unfit for use.

Herewith is a sketch of the split bushing type of boring tool holder which is a familiar device in many shops and is considered to be very efficient for both rigidity and convenience. It is used on the lathe toolblock in the same manner as the collet type holder described by Mr. Clarke in the previously mentioned issue.

## Device to Cut Bolt Holes in Gaskets

By GEORGE BLUM

For cutting or marking bolt holes in gaskets three is probably nothing better than a steel ball and a C-clamp as shown in the illustration. The ball is located on the gasket in alignment with the bolt holes in the flange by feel and is forced into the gasket by the screw in a C-clamp. Bolt holes can be cut in gaskets of some materials by this method, while in other materials they can only be marked. Much depends upon the composition of the



*Bolt holes can be cut or marked in gaskets by forcing the gasket material into the holt holes in the flange by a steel ball and a C-clamp*

gasket, its thickness, the size of the bolt holes and the ratio of ball diameter to that of the bolt holes.

The ball must be somewhat larger in diameter than that of the bolt holes in the flange. For rubber gaskets I have found that a $\frac{1}{2}$-in. ball to be about right for $\frac{1}{8}$-in. holes, while for asbestos gaskets a $\frac{3}{4}$-in. ball is not too large. The screw in the clamp should have a cup point to hold the ball in place. Three clamps should be used, two to hold the gasket in place on the flange while the third is being used to force the ball to cut or mark the holes.

## Tools in Color

By HENRY C. FRANCIS

Identifying tools by color is uncommon, and of course hardly practicable in a large shop where tool cribs and tool checks are used. In the small shop, however, the color scheme has advantages.

Each mechanic in the shops of the Churchill Weavers, Berea, Ky., has a bench with a back board as shown. The back board is painted a light color and each tool shows up plainly. The color of the handles of the tools show where they belong. Those on this bench and board were painted blue. Others were red, white, etc.

When a tool of any kind is left around the shop there is no question as to where it belongs. The color identifies it as Bill's, or Tom's or Joe's. Incidentally these benches tend to encourage neatness and may easily reflect in the work done.

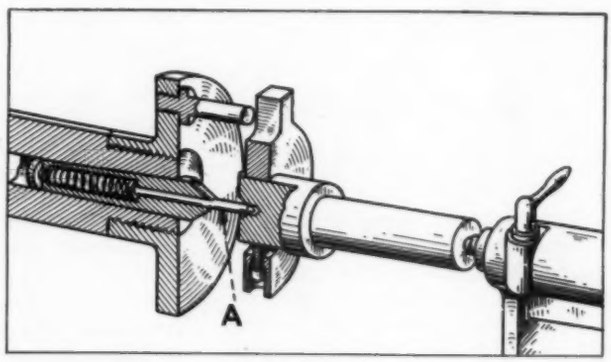
## Non-Stop Changing Device

By F. DOUGHTY
*Shipley, Yorkshire, England*

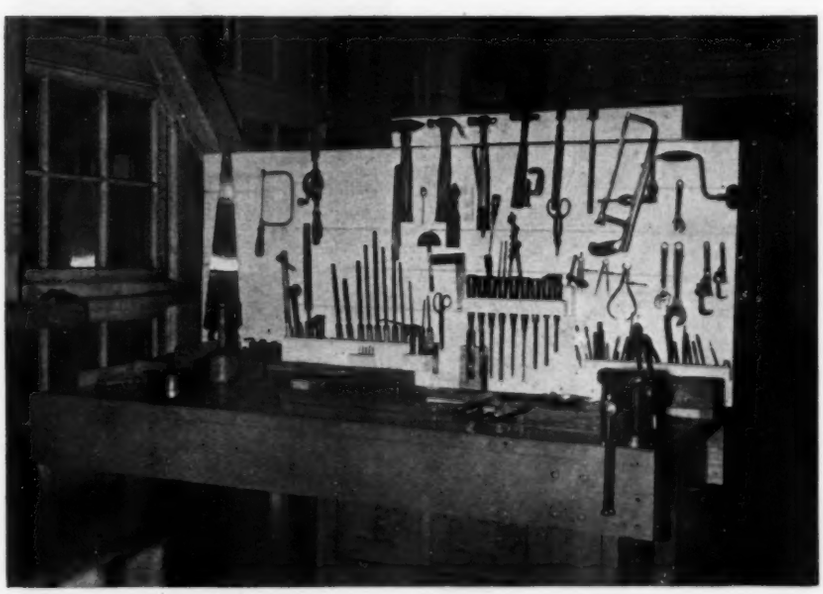
The device illustrated is for putting work in and taking it out without stopping the lathe. It consists merely of fitting a spring-loaded plunger *A* in a hole drilled longitudinally in the live center.

In operation, when a piece has been finished the tailstock center is backed away until the plunger pushes the work off the live center and the tail of the dog comes out of contact with the driving pin in the faceplate and the work ceases to revolve. The operator grabs the work and continues backing away the tailstock center until the work is free and can be removed. When another piece is put in, screwing out the tailstock center causes the work to push the plunger back until the live center is engaged and the tail of the dog is in contact with the driving pin, causing the work to revolve.

Thus, by not having to stop the lathe for loading and unloading, production is increased. The operator has an extra dog at hand to dog the piece to be loaded while the piece in the lathe is being turned, so that there is no delay by changing the dog from one piece to another while the lathe runs idly. The countersink in the live-center end of the work must, of course, be deep enough to permit the point of the center left by drilling the plunger hole to engage the work.




*With this simple arrangement the operator can load and unload the work without stopping the lathe and without danger to himself, thus increasing production*



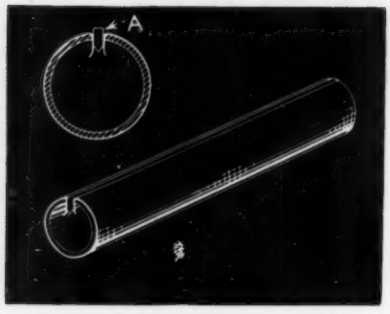
*Each mechanic in this shop is assigned a color which is painted on the handles of his tools, thereby identifying ownership*

## Abrasive-Cloth Holder

By JOHN E. HYLER
*R. G. Le Tourneau, Incorporated*

For finishing fillets, rounded ends and bottoms of slots, the holder for abrasive cloth illustrated is a very convenient tool. It consists merely of a piece of pipe slit lengthwise and the wedge *A* which is the same length as that of the pipe.

A suitable length of abrasive cloth is wrapped around the pipe and the ends are tucked in the slit. Then the wedge is driven in flush with the pipe, expanding the pipe and holding the abrasive cloth securely. The outer corners of the slit should be rounded off




*Abrasive cloth wrapped around the pipe and the ends tucked in the slit is securely held by driving in the wedge flush with the pipe*

slightly with a fine file to prevent them from cutting the abrasive cloth as the wedge is driven in.

In removing worn abrasive cloth, the wedge can either be backed out from the inside of the pipe with a prying tool or it can be driven through the slit so that it will drop inside the pipe. Obviously, the holder can be made from pipe of any diameter that will suit the work on which it is to be used for finishing operations.

## Adjustable Offset Center

By H. MOORE
*Kirkstall, Leeds, England*

We have a job where, for testing purposes, a piece of stock must be alternately turned straight and taper many times. To avoid having to set and reset the tailstock, we use the special center and holder illustrated.

The shank of the holdre *A* fits the taper hole of the tailstock spindle. The body of the center *B* is straight and the hole in which it fits in the holder is elongated to permit the center to be set over the correct distance for turning the required taper. A few turns of the adjusting screw *C* will set the center for turning either straight or taper. In setting over the center it is kept in alignment by the pin *D* which is tight in the holder and has a close sliding fit in the body of the center.

## An Eight-Sided Punch for Porcelain Tiles

By J. C. WATSON

Recently we had to make an eight-sided punch for compressing material for porcelain floor tiles in a built-up mold. While the punch had eight flats or sides it was not a true octagon. The distance across the face between the flats *A-B* and *C-D* is 4.000 in., while the distance between flats *F-H* and *I-K* is 4.1568 in., as shown in Fig. 1. A block of tool steel about 1 in. thick and a little more than 4 in. square was surfaced on both sides and the flats were laid off. It was then clamped to a small angle plate and the flats were roughed out, leaving 0.01 in. for grinding.

After being hardened, the block was ground on both sides and was again clamped to the angle plate which was mounted on a magnetic chuck on the table of a surface grinder. Flats *A* and *B* were ground parallel with each other and to the correct distance between them, rotating the block 180 deg. between cuts. Then flats *C* and *D* were ground parallel with each other, square with flats *A* and *B* and to the correct distance apart. The next step was to grind flats *F-H* and *I-K* at 45 deg. to the flats just ground, as well as to keep them concentric with the center of the block.

Two parallels, *L* and *M* were clamped to the angle plate as shown in Fig. 2, being set to 45 deg. by a sine bar. The block was clamped to the angle plate with flat *F* uppermost and flats *B* and *D* resting on the parallels. Pieces of tissue paper *N* were placed on the parallels so that the contact of the flats could be tested by giving the tissue papers a slight pull. At this setting flat *F* was rough ground. Rotating the block 90 deg. each time, flats *H-I* and *K* were likewise ground. For finish grinding, light cuts were taken, rotating the block 90 deg. for each cut without disturbing the setting of the grinding wheel, the distance between flats being measured by a micrometer as the grinding proceeded. Grinding and rotating the block between cuts was continued until flats *F-H* and *I-K* were the correct distance apart.

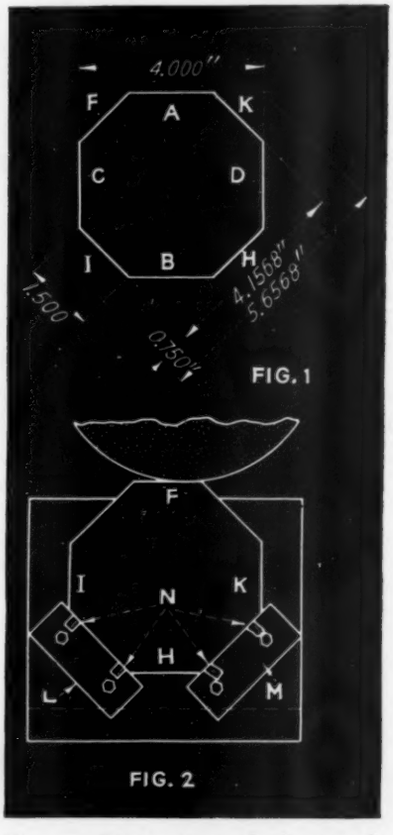
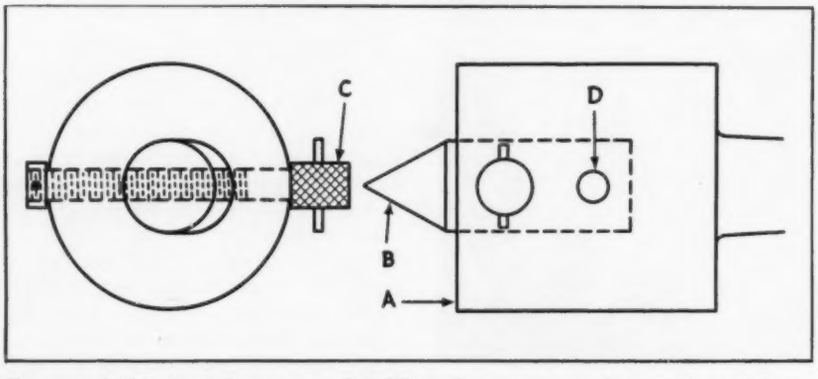



*Fig. 1—Dimensions of the punch. Fig. 2—The punch is located by parallels set at 45 deg. for rough and finish grinding flats F, H, I and K*

It may be of interest to note that the sine bar used for setting the parallels was made from the description of a sine bar in an article published in *American Machinist* some years ago.

It will be seen that the width of flats, *F, H, I* and *K* is 1.500 in. While this dimension is important it cannot be accurately measured, but if the punch is ground to the dimensions given, the width of these flats will be accurately maintained.




*By use of this special center and holder, the center can be set for turning a certain taper and reset for turning straight in a moment*

# Flame-Hardening

*Courtesy of the International Acetylene Association*

FLAME-HARDENING is a process whereby the surface of a quench-hardening ferrous material is locally heated by means of an oxy-acetylene flame followed by a suitable quench, usually a stream of water. An additional quenching action is derived from the relatively cold mass of metal lying below the heated surface.

From a metallurgical viewpoint, flame-hardening has an advantage in that no change of chemical composition takes place in the hardened surface. Flexibility is also an adjunct of this method, since only the portions of the surface which require hardening need to be so affected.

SPEED OF OPERATION. The speed of heating in special furnaces developed for differentially hardening a variety of machine parts is slow compared with the oxy-acetylene blowpipe, with the result that the heat, and consequently the hardness, may penetrate to too great a depth. This often necessitates a sacrifice in surface hardness in order that the body or core of the piece will retain the desired properties.

CASE CHARACTERISTICS. Partly because there is no transformation with accompanying volume change of the core of flame-hardened steel, the stresses between the hard surface and the relatively ductile core are low. This makes for freedom from spalling or "shelling out", which must be avoided in some other methods of surface hardening. The depth of hardness and case may be varied by the heating rate, the composition of the steel being used, and the quenching practice used. The case generally lies between $\frac{1}{16}$ in. and $\frac{1}{4}$ in. in depth, while hardness is at least equal to that resulting in the same steel from furnace hardening.

SECTIONS TREATED. The speed of heating by the oxy-acetylene flame makes possible the surface hardening of sections as thin as $\frac{1}{4}$ in. and even thinner with proper technique. When the part is quickly raised above the critical point and then promptly quenched, flame-hardening produces scale-free parts. Distortion depends on the thickness of the material and the depth of hardening; consequently, great care must be exercised in hardening thin sections. Thick sections present no problem, because the core is heated but slightly and the surface contour is preserved. Generally, distortion is well within manufacturing tolerance.

QUENCHING. The same quenching principles used in all heat-treating operations apply to flame-hardening. However, in flame-hardening, only a superficial layer of metal is heated to the hardening temperature. The relatively cold mass of metal lying below the heated surface subtracts heat from the superficial layers and produces a more drastic quenching action than would result from liquid alone. This produces an initially harder surface than could be obtained with the conventional method of heating the mass of metal to the center and then abstracting all of the heat through the surface in the conventional quenching bath. With some conditions it is possible to dispense entirely with quenching. Thus, flame-hardening presents advantages in making possible heat-treatment of spots or restricted areas.

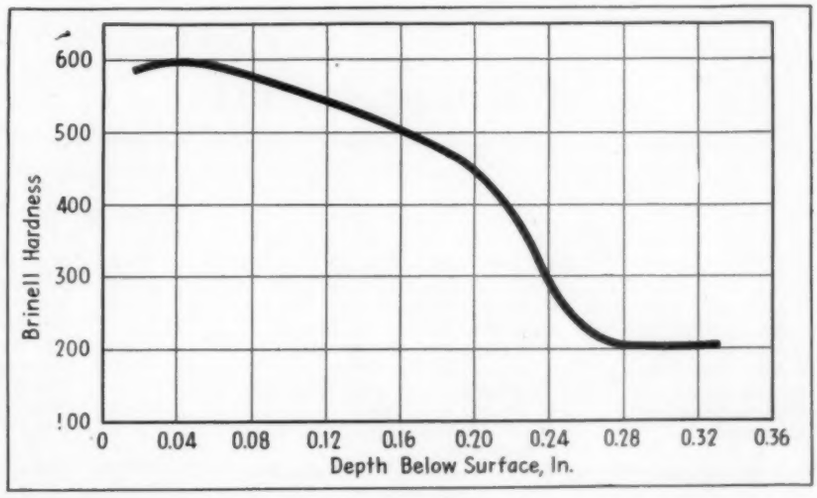
Should a steel be selected that is capable of being hardened to 600 Brinell, the quenching or application of the coolant may be interrupted some time after transformation has started so that a lower order of hardness, say 400 Brinell, can be attained. Similar results can be obtained by using a mild quench, but it is not always convenient to employ a quench other than water. Thus, the flexibility of the flame hardening process, makes it possible to produce desired results conforming to immediate conditions.

### Flame Hardening-Methods

HEATING. The operations of flame-hardening may be classified as (1) stationary, (2) progressive, and (3) spinning.

In the stationary procedure, the blowpipe and the work are both motionless during the operation. This is sometimes called "spot hardening". The effectiveness of the process can be determined by locally hardening a small piece of medium-carbon steel with a welding blowpipe, or with the preheating flames of a cutting blowpipe, and then quench with water.

In the progressive method, the flame and work are moved relatively to each other, and the metal is quenched as it is brought up to temperature by the moving blowpipe. For flame-hardening a plane surface, the lighted blowpipe, with a head producing a sufficient flame area to cover the path to be hardened, is directed along the surface at the maximum speed which will heat the




*This hardness exploration of the flame-hardened case on S.A.E. 1045 steel is typical of results obtained with flame-hardening*

# Flame-Hardening

surface zone to above the critical point of the steel. Immediately behind the flame is a stream or spray of water which progressively quenches the heated surface. Speed is determined by operating variables such as flame intensity, type of steel being treated, and the temperature desired. A speed of 6 to 8 in. per min. is usually recommended.

In the spinning method, applied principally to rounds, the blowpipe is stationary and the work is rotated before the flame. When the entire area has reached hardening temperature, the quench is applied while the work is still rotating. Hardening time by this method will vary from a few seconds to 2 or 3 min. Frequently, the blowpipe or heating head can be set up to traverse the work from end to end as the work is rotated.

QUENCHING. Quenching attachments are usually affixed to the heating head for progressive hardening, thus insuring a constant relation between heating and quenching. Many devices may be used, ranging from a simple stream of water from a round nozzle to a spray from a carefully designed nozzle. Spinning operations are better controlled by quenching with a large volume of water under low head; this simulates total immersion.

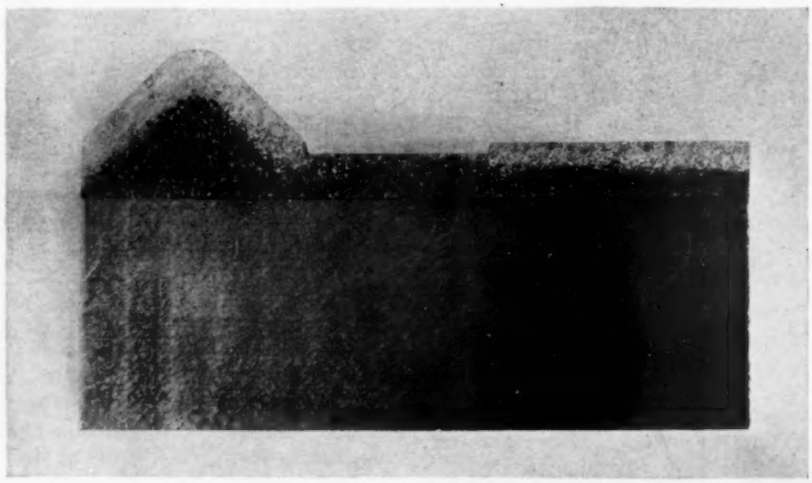
Certain steels cannot be quenched with water, in which case soap-water solutions or soluble cutting oil in water can be used.

DRAWING. Flame-hardening operations should be immediately followed by a low-temperature draw to relieve quenching stresses. This can be done in an oil bath or oven. However, while generally recommended, the drawing operation is not always necessary, since by carefully controlling the quantity and application of the quenching medium, or delaying its application, the hardening treatment may be made self-drawing.

### Applications of Flame-Hardening

Flame-hardening is adaptable to complicated parts with little danger of distortion or other faults. It is used for treating rail ends, pump liners, crane wheels, gears, tractor shoes, sheave wheels, machine ways, valves, crankshafts, camshafts, and similar parts. Oil-field applications include ball races for rotary tables, universal joints for mud holes, draw works, gear teeth, sucker rods, and box and pin ends of drill pipe.

Flame-hardening should not be considered a universal tool adaptable to all types of material that require surface hardening. It has certain limitations. For instance, it may be more economical to batch-harden a large number of small parts by means of case hardening or nitriding.



*Cross-section of a flame-hardened cast-iron lathe bed-way shows the depth of hardness attained (approximately $\frac{1}{8}$ in.) and the close grain structure*

**FLAME-HARDENING STEELS**

| Steel | Analysis | Case Hardness* | |
|---|---|---|---|
| | | Scleroscope | Brinell |
| S.A.E. 1035–1070 | C-.30-.80, Mn-.70 max. | 50–90 | 350–700 |
| S.A.E. T1335–T1345 | C-.30-.50, Mn-1.60-1.90 | 75–90 | 550–700 |
| S.A.E. 2340–2350 | C-.35-.55, Ni-3.25-3.75 | 70–80 | 500–600 |
| S.A.E. 4140–4150 | C-.35-.55, Cr-.80-1.10, Mo-.15-.25 | 70–85 | 500–650 |
| S.A.E. 4640 | C-.35-.45, Ni-1.65-2.00, Mo-.20-.30 | 70–80 | 500–600 |
| S.A.E. 5140–5150 | C-.35-.55, Cr-.80-1.10 | 70–85 | 500–650 |
| S.A.E. 6135–6150 | C-.30-.55, Cr-.80-1.10, V-.15-.20 | 75–85 | 550–650 |
| Carbon-Vanadium | C-.45-.65, V-.15 min. | 70–90 | 500–700 |
| Cromansil | C-.30-.45, Cr-.40-.60, Mn-1.00-1.30, Si-.70-.90 | 75–85 | 550–650 |
| Manganese-Molybdenum | S.A.E. T1335 or T1340 plus Mo-.15-.25 | 75–85 | 550–650 |

* Hardness determinations on flame-hardened parts should preferably be made with the scleroscope. The Brinell numbers shown here have been converted. Hardness figures are for water-quenched materials.

### Flame-Hardening Steels

Plain carbon steels can be hardened satisfactorily provided the carbon is more than 0.40 per cent. The upper limit of carbon is dependent upon the method of hardening used, but it is generally safe up to 0.70 per cent carbon or higher depending upon the section.

Alloy steels are satisfactorily flame-hardened through a wide range of compositions, but because of economics the application of the method to this class of steel is restricted generally to the low or medium alloy types; that is, in which the percentage of the principal added elements is low.

# Slowdown or Sabotage?

THE SLOWDOWN is organized labor's newest strike technique. How it works, what its results are, the pertinent questions which it raises, are aired on page 956 in a special article, "Lowdown on the Slowdown."

"Slowdown" and "skipping" usually go together. In case you don't understand such terms, I add that the slowdown is a deliberate reduction in normal production speed by factory workers and skipping is the practice of letting work go down a line without being processed. Men, for example, may sand three automobile bodies in a row, then stand back and let the fourth pass by without being touched.

No one denies that employees at times have legitimate grievances which should be corrected. No one denies that employees have a legal and moral right to bargain collectively with their employers. No one denies that they have the right to strike if they so desire.

But they do not possess the right to take over their employer's plant by means of a sitdown, nor do they have the right to defraud their employer by refusing to give him a full day's work for a full day's pay.

The slowdown is a strike weapon which, like its blood brother the sitdown, should be outlawed. For it is a lawless sort of thing, no matter how you look at it. It breaks down all discipline and takes out of the hands of the employer the rightful management of his own business.

For if the union can regulate the production rate up or down at will by ordering men to operate at 50, 60, 70 or 85 per cent of the normal standard, the union has usurped the management's function.

Resort to such tactics as the slowdown is bound to bring public condemnation and to obscure the real issues involved in a dispute if there are any. For the sake of its own standing with the public, labor will do well to put aside the slowdown as a discredited technique which loses for the labor cause more than it possibly could gain.

When the public woke up to what the sitdown is, it expressed its disfavor in no uncertain terms. The result is that the sitdown is as outmoded as milady's last year's hat. The same public reaction already is apparent in connection with slowdowns.

The slowdown is offensive to the average American's sense of fair play. Union leaders should be wise enough to toss it in the ash can voluntarily before the force of public opinion compels them to. Whoever advocates its use is no friend of the American workman.

Burnham Finney

# GAGING BUSINESS

Additional speeding up of entire metal-working industry caused by repeal of arms embargo. Government's national defense program further accelerates industrial activity.

War needs, now that the bars have been lowered on shipment of planes and munitions to Europe, are responsible for a speeding-up of metal-working operations. The most spectacular phase of this activity is in aircraft, but a boom fever permeates the whole industry. Much of the impetus is provided by the U. S. Government's national defense program. In fact, contracts valued at almost $20,000,000 were placed with metal-working companies by the army and navy the past two weeks. This is on top of orders for $18,000,000 the previous fortnight. In some branches of the industry, notably aircraft, difficulty is being experienced in getting enough skilled mechanics. In justice it should be said that a big slice of current business is for peace-time products and does not trace back to war origins. With manufacture at an abnormally high level, executives cannot help but wonder how long the present spurt will last.

MACHINE TOOLS—Sales of some machine tool builders have soared sky-high, exceeding the previous record attained in September. Other companies, however, have not taken so much business because their delivery promises are so far in the future. Buyers are exerting terrific pressure on machine tool companies to secure priority of treatment. The French are buying tools right and left, with a possibility that purchases may total 10,000 machines. A variety of domestic industries, led by aircraft makers, have been substantial buyers. Government orders continue in impressive volume. The British, Russians and Japanese have placed sizable contracts here. For many months ahead the industry's production will be limited only by its plant capacity.

HEAVY ELECTRICAL EQUIPMENT — Public utility companies have placed large orders for new generating equipment. The government also has awarded new contracts of considerable size.

AIRCRAFT—Flooded with orders from the Allies, from neutrals and from the U. S., aircraft makers are expanding output as rapidly as they can secure skilled men. The industry's backlog exceeds $300,000,000. Of those bookings Douglas has $78,000,000, Curtiss-Wright $70,000,000, Glenn Martin $65,000,000, Lockheed $32,000,000, North American $27,000,000, Republic $10,000,000. Benefits from this business have spread out into scores of small as well as large parts factories and job shops. This "farming-out" program is designed to speed production, because for the French and British, in particular, time is the crucial factor. The Allies are advancing funds to aircraft parts makers as well as to engine builders to help build plant additions quickly.

STEEL—Unrelenting pressure from steel users for rush delivery has kept mills operating above 90 per cent, an all-time high for the industry. Inquiries reveal that most of the steel is being processed into consumer goods immediately upon delivery to customers. Likelihood of a general rise in first quarter steel prices is fading. It would be no surprise should steel demand slide off somewhat after the year-end.

SHIPBUILDING—Almost all shipyard ways now are engaged. As more work progresses from the blueprint stage to actual manufacture, payrolls are growing. With 126 new navy ships to be proposed to Congress in January, on top of the so-called billion dollar building program already started, shipbuilding promises to rival aircraft as the country's busiest industry.

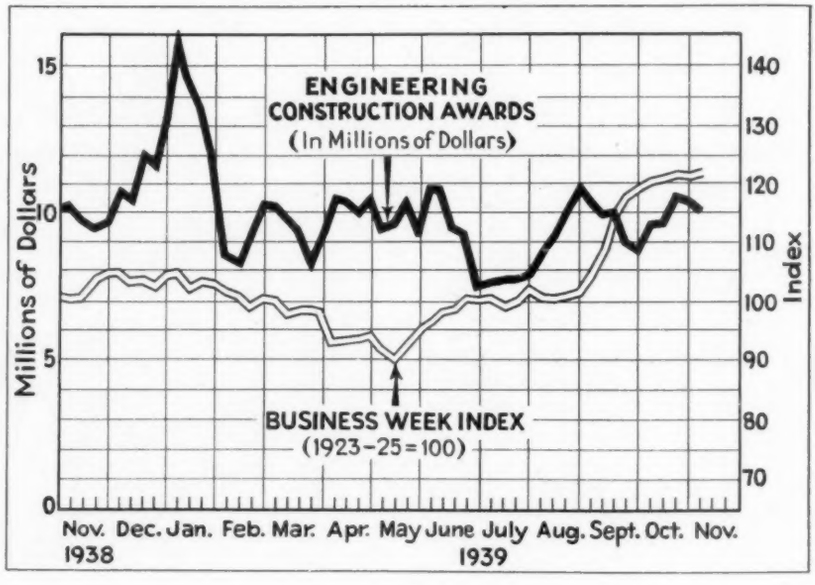
FARM IMPLEMENTS—Majority of plants are entering their busy season stocking dealers for spring sales. International Harvester factories still are working hard to catch up with dealers' requirements for small tractors.

RAILROAD EQUIPMENT—Car orders this year stand a good chance of reaching the 1936 total of 64,500 units. From 35,000 to 40,000 cars have been contracted for since September 1, and more business is in prospect. Awards the past ten days have amounted to 2,500 cars. Most car equipment builders will be fully occupied all winter on present orders.

RADIOS — Several makers report sales far ahead of last year. Zenith is turning out 12,500 sets a day, with orders booked far in advance. Philco anticipates the best year in its history. Demand is for short-wave sets (because of the European situation), small models and automobile radios.

## ENGINEERING CONSTRUCTION VS. GENERAL BUSINESS

*One of the few activities not yet spurred by the war, engineering construction is likely to show little gain in the face of rising costs*



# NEWS OF THE INDUSTRY

## HUGE AIRCRAFT ORDERS PLACED BY ALLIES SINCE ARMS EMBARGO REPEAL

NEW YORK—The French have bought 4,600 aircraft motors from Wright Aeronautical and from Pratt & Whitney in addition to those on order when the embargo was lifted. It is expected the French also will buy 3,800 planes as well as large quantities of aircraft parts to be assembled into planes in France.

The British shortly will purchase at least 1,500 training planes in the United States, mostly going to the smaller companies for these orders. A Dutch mission now in this country is buying aircraft, machine tools and other products. Finland is negotiating for 200–600 planes. Sweden likewise is in the American market.

**France in Spotlight**

France is expected to be a much larger plane purchaser than the British, because the latter are approaching adequate production in England. Some of the planes for the Allies will be built of their own design.

Orders for U.S. airplanes and accessories are estimated at about $300,000,000. This business is divided as follows: Glenn Martin, $65,000,000; United Aircraft, $70,000,000; Curtiss-Wright, $70,000,000; Douglas, $78,000,000; Lockheed, $32,000,000; and Republic Aviation (formerly Seversky) $10,000,000.

Around 300 planes are being shipped immediately to the Allies. Nearly 500 more planes and 2000 engines will be ready soon.

A vast mushroom growth of subcontract and parts services to major airplane builders is evident, encouraged by the War Department as the most logical means of preventing over-expansion of plant for home, civil and military needs.

## $2,000,000 EXPANSION PROGRAM PLANNED BY BENDIX AVIATION

SOUTH BEND—Directors of Bendix Aviation Corp. have approved a $2,000,000 expenditure to enlarge the company's aviation manufacturing division in anticipation of an increase in 1940 business to $25,000,000, compared with about $16,000,000 this year.

## Tremendous Increase in Naval Power Planned As Most Effective National Defense Measure

*Removal of Restrictions Urged to Promote Faster Construction of Units*

By BLAINE STUBBLEFIELD

WASHINGTON—Recent world events demanded that the United States back down from the Monroe Doctrine or back it up. The decision has been made and the choice of weapons is warships. Next session of Congress will be asked to vote about $1,300,000,000 for construction in the next four years of 126 vessels, 2,395 airplanes and 36 lighter-than-air ships—an increase of 25 per cent in the composition of the Navy. This is over and above the 20 per cent billion dollar increase authorized by Congress in 1938, which is already being carried forward with appropriations already made and with more to come.

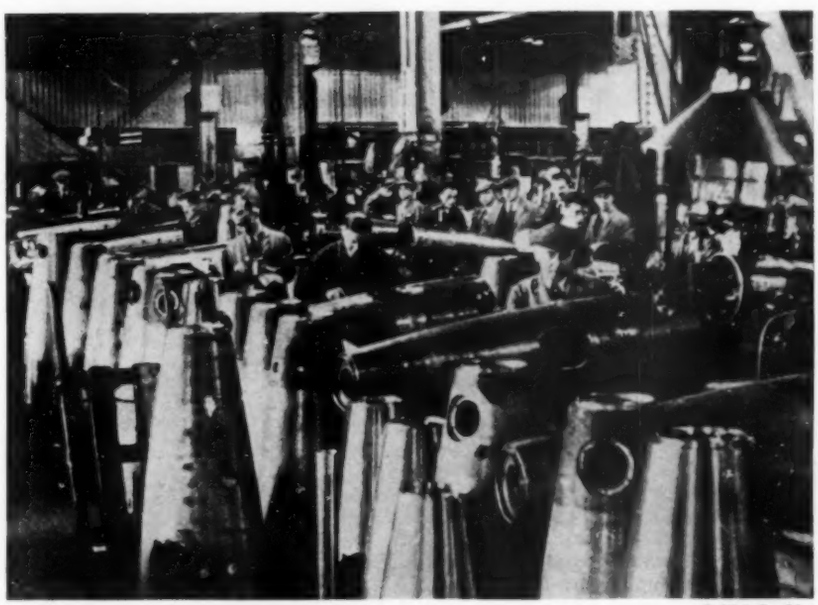
The Administration now asks for the addition of 3 aircraft carriers, 8 cruisers, 52 destroyers, 32 submarines and 31 auxiliaries. The bill is being drafted by Chairman Carl Vin-

### FRENCH MAY BUY 10,000 MACHINE TOOLS IN U. S.

WASHINGTON — The French buying mission is in the American market for thousands of machine tools for production of aircraft parts and of munitions. The total number purchased may reach 10,000. When asked about this figure, French embassy officials refused to confirm or deny it.

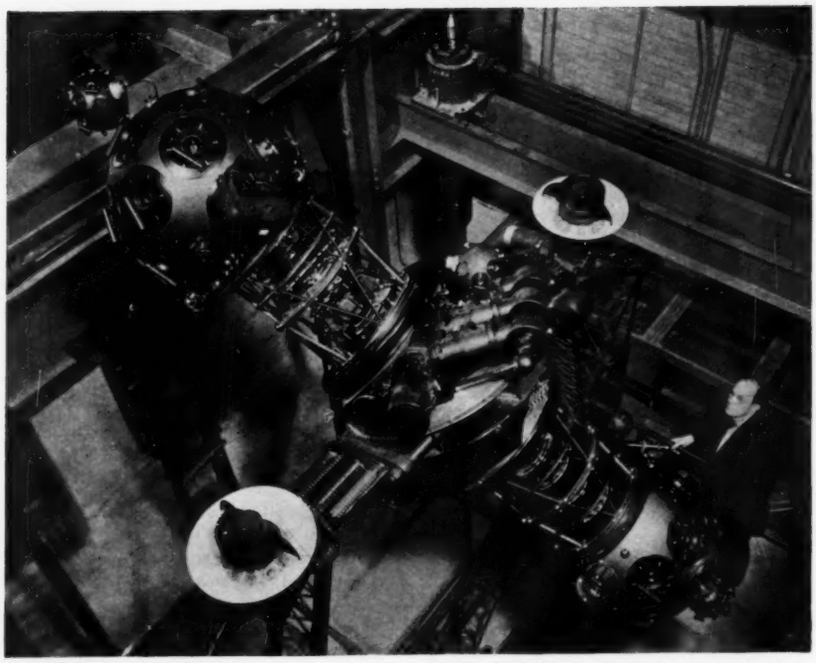
Expansion of machine tool plants will not be financed by the French, however, though that plan is being followed in the aircraft industry.

Those wishing to sell machine tools and aircraft parts to the French should communicate with J. A. Maillet, French Air Commission, Room 626, 610 Fifth Avenue, New York City. A separate group of officials at the same address is buying other commodities.



*British Combine*

**Fight Fire with Fire**—*That England hardly intends to let Nazi submarine attacks go unanswered is indicated by the number of torpedos being manufactured in this British plant. Shortage of torpedoes is a minor problem*



**Star Maker**—*Director James Stokley of Pittsburgh's new Buhl Planetarium rides the elevator carrying the three-ton projector. A 20-hp. Westinghouse motor, driving four screws through reduction gearing, furnishes the power*

son of the House Naval Affairs Committee, obviously with the cooperation of the Navy and the Administration. It will be introduced when Congress convenes Jan. 3, and hearings will start Jan. 8.

### Private Yards Favored

Mr. Vinson said Congress will be asked to repeal the present provision that 50 per cent of construction be done in Navy yards. No new fixed division between federal and private yards will be set up. Construction will be allocated to best advantage for speeding the work. The bill will provide that any part of the authorized appropriations may be used at the discretion of the President for construction of additional ways and facilities. Up to 30 per cent of the cost of construction will be advanced to builders who require it. The present 10 per cent profit limitation probably will be retained. There is a provision in the present draft of the bill that would relax the established system of competitive bidding, and a serious fight will be made against it.

Authorization of additional airplanes for the Navy seems unnecessary, as the 1938 act provides for "a total of not less than 3,000," meaning apparently that any number over 3,000 could be built. But House Navy committeemen explain that the intention was to set a minimum, not to authorize unlimited expansion. Thus the new minimum naval air strength would be 3,000 plus 2,395 planes.

President Roosevelt said at his press conference Oct. 17 that a "two-ocean navy" was a beautiful slogan, but it was too simple. He said the question would arise in given circumstances whether one navy should be divided between two oceans, or two navies be put in one ocean. The only certainty at this time is that we need an adequate Navy. Other observers, seeming to agree with Mr. Roosevelt, say that the Panama Canal must be defended at all costs so that the full power of the fleet can be brought to bear quickly where it may be needed. Present strengthening of the Canal bears out that contention as government policy.

Competent observers have warned lately that the concept of naval construction might change radically if the aerial attacks by England and Germany on each other's fleets were successful. The conclusion to be drawn from the Administration's plan to expand the U. S. fleet along conventional lines is that airplanes do not promise as yet to displace floating steel. It is noted, however, that Vinson's bill will authorize the President to alter the building program within the specified categories. This might or might not mean that the Navy is uncertain about the part that aircraft will play.

## U. S. Government Contracts Awarded to Metal-Working Firms

(Machine Tool Contracts on page 966j)

| Contractor | Gov't Agency | Commodity | Amount |
|---|---|---|---|
| Philips & Buttorff Mfg. Co., Nashville, Tenn. | CCC, War | Heating stoves | $61,597 |
| A. N. Eaton Metal Products, Omaha, Neb. | Agriculture | Grain bins | 80,106 |
| Butler Mfg. Co., Kansas City, Mo. | Agriculture | Grain bins | 980,380 |
| Kilby Steel Co, Anniston, Ala. | Agriculture | Grain bins | 178,220 |
| Sioux Steel Co., Sioux Falls, S. D. | Agriculture | Grain bins | 165,370 |
| Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. | Ordnance | Pistol parts | 99,189 |
| Smith & Wesson, Inc., Springfield, Mass. | Ordnance | Revolver parts | 92,588 |
| A. B. Farquhar Co., York, Pa. | Ordnance | Mortars, mounts | 128,459 |
| R. L. Rettew & Co., Lebanon, Pa. | Ordnance | Lifting plugs, adapters fuze | 120,509 |
| General Electric Co., Schenectady, N. Y. | Ordnance, GPO, Navy, Interior | Electrical equipment | 692,132 |
| American Brass Co., Waterbury, Conn. | Ordnance | Cartridge cups, metal | 293,487 |
| Scovill Mfg. Co., Waterbury, Conn. | Ordnance, Treasury | Cartridge cases, parts, 5¢ blanks | 731,107 |
| Revere Copper & Brass, Inc., Baltimore, Md. | Ordnance | Cartridge disks | 157,275 |
| Kidder Press Corp., Dover, N. H. | GPO | Printing press | 73,134 |
| York Ice Machinery Corp., Philadelphia, Pa. | Navy | Refrigerating plants | 71,702 |
| Ingersoll-Rand Co., Phillipsburg, N. J. | Navy | Air compressors | 83,736 |
| Enterprise Engine Co., Div. Enterprise Foundry Co., San Francisco, Calif. | Navy | Diesel engines | 105,900 |
| Baldwin-Southwark Corp., Eddystone, Pa. | Interior | Turbines | 905,060 |
| Cooper Bessemer Corp., Grove City, Pa. | Navy | Diesel engines | 70,250 |
| DeLaval Steam Turbine Co., Trenton, N. J. | Navy | Pumps | 151,200 |
| Allis-Chalmers Mfg. Co., Milwaukee, Wis. | Ordnance | Tractor cranes | 61,825 |
| National Supply Co., Philadelphia, Pa. | CAA | Generator plants | 75,684 |
| Federal Telegraph Co., Newark, N. J. | CAA | Radio equipment | 311,906 |
| Ryan Aeronautical Co., San Diego, Calif. | Air Corps | Airplanes | 197,865 |
| Fairchild Aircraft Corp., Hagerstown, Md. | Air Corps | Airplanes | 1,586,573 |
| Curtiss-Wright Corp., Curtiss Aeroplane Div., Buffalo, N. Y. | Air Corps | Airplanes | 5,203,481 |
| Seversky Aircraft Corp., Farmingdale, N. Y. | Air Corps | Airplanes | 3,547,255 |
| Bell Aircraft Corp., Buffalo, N. Y. | Air Corps | Airplanes | 2,833,236 |
| Defoe Boat & Motor Works, Bay City, Mich. | Navy | Submarine chasers | 1,122,400 |
| Pioneer Instrument Div., Bendix Aviation Corp., Bendix, N. J. | Navy | Instruments | 51,760 |
| Glenn L. Martin Co., Baltimore, Md. | Air Corps | Airplanes | 16,125,586 |
| Boeing Airplane Co., Stearman Aircraft Div., Wichita, Kan. | Air Corps | Airplanes | 2,843,405 |
| North American Aviation, Inc., Inglewood, Calif. | Air Corps | Airplanes | 11,847,653 |
| Bausch & Lomb Optical Co., Rochester, N.Y. | Ordnance | Telescopes | 92,500 |
| Bethlehem Steel Co., Bethlehem, Pa. | Ordnance | Shells | 449,345 |
| Simplex Wire & Cable Co., Cambridge, Mass. | Signal Corps | Wire | 473,518 |
| Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. | TVA, Ordnance, Navy | Electrical equipment | 91,663 |
| Caterpillar Tractor Co., Peoria, Ill. | Procurement, Navy, QMC | Tractors | 91,122 |
| Elliott Co., Jeanette, Pa. | Navy | Feed-water heaters | 74,760 |
| Cochrane Corp., Philadelphia, Pa. | Navy | Feed-water heaters | 78,065 |
| Bridgeport Thermostat Co., Bridgport, Conn. | Ordnance | Packing crates | 53,609 |
| United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn. | Navy | Engines | 370,490 |

# INSIDE DETROIT

By Rupert Le Grand
DETROIT EDITOR

Manufacturers will not add extra shifts despite lack of showroom models. Ford tractor first-year schedule calls for 60,000 units. Production continues to rise despite Chrysler strike

DETROIT—Demand for new cars is so brisk that dealers throughout the country have operated recently with less than a two-week's supply. Should Chrysler remain out of the running for even a short time after this is written, it is probable that most dealers will find themselves with only a week's supply of new models, and that a goodly portion of this number will be in transit between the factory and the showroom.

All sorts of tales are current about what dealers are facing in Detroit. Fords for example are being quoted at two to four weeks delivery; the Mercury at periods up to five weeks. Chevrolets are being snapped up so fast that dealers are begging customers to allow their cars to be placed on exhibition, because so many prospects have not even seen a 1940 model. Buick outlets will not promise delivery of a new Super 50 or Roadmaster (with the wide body) before February or March. And so it goes.

What will the industry do to alleviate this situation? Will manufacturers add extra shifts, or bump up production by other means? The answer is that they are going to manufacture as many cars as they can with the present number of shifts and facilities already tooled up, and let it go at that.

### No Extra Shifts

There are a number of good reasons why this must be so. First of all, the industry has learned the value of maintaining operations as stable as possible, both upon plant efficiency and upon public opinion. Automotive leaders abhor the idea of putting a large number of people to work for a few weeks and then letting them go when the need for extra shifts has passed. In some measure the present demand upon all dealers is a reflection of the Chrysler situation, which may end at any time. Then too, cold weather always has an adverse effect upon factory sales. Thus, while a boom outreaching anything experienced in recent years is under way, there is no reason to throw discretion overboard.

Should production be upped to dizzy peaks and then dropped, the effect upon business generally could not be anything but adverse. Public opinion would hold the industry guilty of an attempt to make quick profits and heartless in its treatment of laid-off employees.

Quick hiring and firing of workers would play into the hands of the unions. In the first place, hiring would have the effect of adding members for the CIO. Then when layoffs became general, protests would be raised against the practice, demands would be made to spread the work, slowdowns might be experienced.

### Relief a Factor

There is another side to the question of putting a large number of workers on the payroll and then letting them go in a short time. Bookkeeping incidental to social security and state unemployment compensation would prove expensive but not a severe drag. The real question is whether persons now on relief would want to leave it for temporary employment. Should they fail to earn $250 per quarter in the automobile industry, their benefits under the unemployment compensation act might only amount to $4-$5 per week instead of $15. Thus, it would not be humane to give temporary employment with the knowledge that displaced workers would have a hard time to get adequate compensation or relief.

If these objections to extra shifts are disregarded, what is the situation in respect to plant efficiency? Assuming that capable labor can be

### PRODUCTION JUMPS 57 PER CENT

DETROIT—Production of cars and trucks in October, United States and Canada reached 338,000 units, despite the Chrysler shutdown after Oct. 6. Output during the month was 57 per cent ahead of October 1938. Production during the first ten months was 2,908,000 vehicles, or 57 per cent ahead of the same period a year earlier.

November should see a substantial increase, even though Chrysler is closed for the majority of the period. Chevrolet has re-opened its Buffalo plant and will soon reach its peak capacity of 30,000 per week with presently tooled facilities. Output of all General Motors units is currently running in excess of 45,000 units. Ford is currently producing 4,000 Ford models per day.

**In Line for Alignment**—*Chevrolet front wheel toe-in, camber and caster are pre-adjusted on a battery of special fixtures at the Detroit gear and axle plant before the suspension mechanism reaches the final assembly line. Normal coil spring loading is duplicated by heavy weights. Flush pins and indicators bear on a sleeve slipped over the wheel spindle to check camber and toe-in. Machined pads in the fixture base check the caster*

**Own Show**—*RotoMills and RotoShavers proved centers of attraction at the National Broach & Machine Co. exhibit held in its new 17,000-sq.ft. plant addition at Detroit. Above, president R. S. Drummond, right, and Ex-Cell-O Corp. president and general manager Phil Huber examine a cast steel steering knuckle finished on the new machines. Also displayed were a redesigned line of gear shaving, speeding, and lapping machines, and a simplified type of involute and lead checker. Over 500 persons attended the exhibit*

found in adequate numbers (and this is doubtful), there must be an interval while new men are made familiar with the work. By the time that reasonable efficiency is obtained, the need of the extra shifts may have passed. Thus, little if anything is gained by adding extra shifts. The cars so produced would in all probability bear an excessive shop burden as compared to the regular line of production.

Most concerns do not have adequate facilities to support full additional shifts on the assembly line—which is the determining factor in automobile output. Parts departments may already be working on a 24-hour basis. One of the large units has several key departments in this category. Additional facilities can not be economically installed for a short period of operation, even if equipment could be obtained. The productivity of machines also has a bearing. Their hourly output can not be raised. Increasing the number of hours worked at the machine will not necessarily establish a balance between its output and consumption of an additional assembly shift.

### Tractor Output Increases

Production of the new Ford tractor is steadily climbing, and may reach 600 per day within a few months. Equipment is still going into the Rouge plant for production and assembly purposes. Output during September averaged 100 units per day, crept up to 125 in the first half of October and is currently running between 175-200. A conservative estimate of the first year's production is 60,000 units.

Already 4,000 of the new farm machines have been shipped and a dealer organization of 1,400 is reported clamoring for more. Approximately five implements for use with the tractor are now available to farmers, and fifteen more are nearing completion on the drawing boards. Demand for the tractor follows strongly the development of suitable implements.

Opportunities also exist for adapting the tractor to industrial uses. The domestic farm market will undoubtedly be served first, but it is believed that the strong demand existing in numerous fields both at home and abroad will cause the Ford Motor Company to invest additional sums in order to major parts production and assembly operations.

### HAND GRENADE ORDER REPORTED

CHICAGO—The French buying mission is reported to have awarded a contract for 1,000,000 hand grenades to an undisclosed middle west manufacturer. The French are known also to have placed an order for torpedoes. The British have contracted for production of five-inch shells at a plant located in Cleveland.

## FRENCH TO MAKE ROLLS ROYCE ENGINE; BUYING TOOLS IN U. S.

DETROIT—At least $2,000,000 worth of machine tools will be bought in this country over the next year for shipment to France for production of the Rolls Royce Merlin engine. But no longer is the Ford Motor Company directly interested in the matter. Last spring the project was hot, Ford and Lincoln master mechanics and purchasing agents commuted to Europe, the groundwork was laid for a production plan that would be according to the most modern American concepts of production. Then Henry Ford stepped in and ordered the matter shelved.

Meanwhile Ford enterprises in France were undergoing a reshuffling because of the nature of their products or vulnerability to invasion. Fordair, S.A., Anieries, near Paris, was converted into a wholly owned and managed French enterprise. This concern has been associated with aircraft production for years, and it will carry out the plans to set up manufacture of the Merlin engine. The Anieries plant is suitable only for assembly purposes, so that actual manufacture and assembly of the aviation engine will be conducted at Bordeau and at the new Ford plant at Poussy that was announced earlier (AM—Vol. 83, page 576*d*).

On Oct. 21 a Fordair subsidiary, Machinery Suppliers, Inc., 8505 West Warren, Detroit, was set up to act as the buying agent for American machine tools and the appropriate tooling therefore. L. W. Mix, long associated with Ford enterprises in France, is in charge. Rolls Royce has agents in this country to act in an "advisory" capacity.

Some machines have already been purchased by Machinery Suppliers, and will be shipped soon. Policy is to pay in advance for special machines and to pay 25 per cent down with order and the balance upon shipment for the more standard varieties. A tool design force will be set up in order to work out the details of the production plan already laid down by the Lincoln Motor Division. That plan was shipped to Europe after the project was tabled by Mr. Ford, and was overdue in this country when this was written

The original plan called for a daily output of five engines. Instructions from Fordair may conceivably double this number, so that the machine tool program may actually lie between $3,000,000–$4,000,000.

Location of Machinery Suppliers in a portion of the Graham-Paige plant is declared to have no significance. It does occur to one, however, that Graham-Paige is strategically located with respect to Lincoln and Ford, should events make a closer tie-in more acceptable.

## PURVIS HEADS BRITISH BUYING; MACHINERY, AIRCRAFT WANTED

WASHINGTON—Arthur B. Purvis, a Canadian who made large purchases for Britain in the United States during the world war, has been appointed director general of purchases for the British government in the United States. He will be located in the British consul general's office at 25 Broadway, New York. He will be under the direction of the British Supply Board in Canada and the United States of which Colonel J.H.M. Greenly is chairman.

Mr. Purvis will make only a few new contracts with U.S. firms, it is reported. These contracts will be for machine tools and aircraft. His office will be concerned principally with priority of deliveries and securing materials already contracted for.

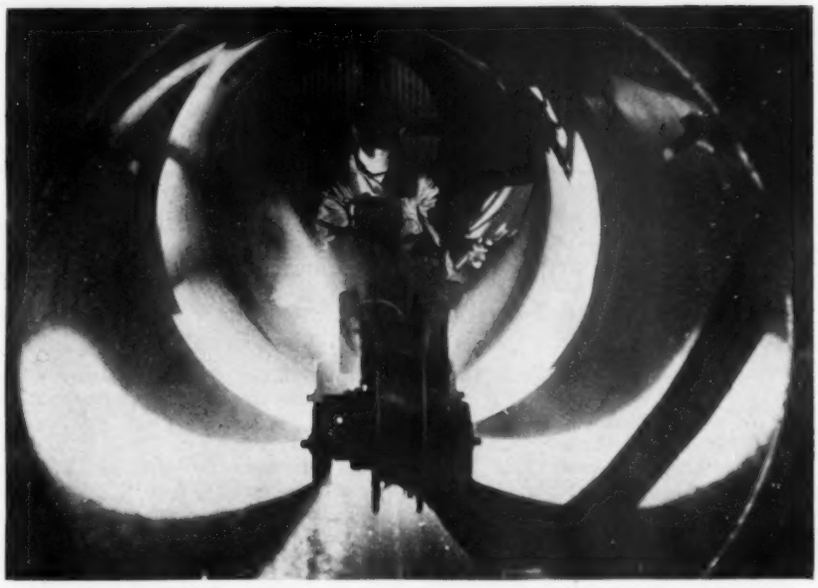
The British expect to enter into few new business relationships as a result of the war. Since the outbreak of war large orders have been placed in London through representatives of U.S. firms known there to the British. The great bulk of buying will continue to be done in that way. If U.S. companies with British contracts must expand their own sources of supply, they will make their own sub-contracts.

**Reserves Still Adequate**

Regret is expressed privately by the British that so many exaggerated reports have been printed about the amount of buying the Allies will do. They point out that the course of the war has not been such as to use any substantial portion of the large reserves accumulated in anticipation of hostilities. There has been so far no destruction of industrial establishments as in 1914. Moreover, the industrial capacity of the British Empire and France is much greater than at the outbreak of the world war.

## SHORTAGE OF SKILLED LABOR CURTAILS AIRCRAFT PRODUCTION

NEW YORK—Chief problem of the aviation industry is securing skilled workmen in sufficient numbers to fulfill current contracts within a reasonable time. Allison, about to open a new airplane engine plant at Indianapolis, is reported having difficulty finding 600 machinists. Their representatives are said to have been scouring the country with poor success. Wright Aeronautical has been advertising widely for skilled machine operators, Douglas also is known to have been searching for men. New orders for airplanes make it necessary for the aviation industry to expand its labor force from around 45,000 men now to 80,000 next spring.



**Weld on Wheels**—*"Electronic Tornado" tractor-type automatic arc welder made by the Lincoln Electric Company fuses two half-cylinders together to form a 51-in. steel pipe from ⅜-in. plate. Over thirteen miles of the pipe will be used in the Colorado River aqueduct now under construction*

### BELGIUM BUYING AIRCRAFT

NEW YORK—The Belgian military mission in this country will spend $6,600,000 for a virtually new Belgian air force. Orders will be placed for airplanes, aerial instruments, anti-aircraft equipment, army equipment and machine tools. With its headquarters in the Belgian embassy at Washington, the mission will stay five to eight weeks in the United States, visiting factories in the East and Middle West. It is headed by Major Maurice Theis.

## ARMY ORDERS PROMINENT IN LATEST GOVERNMENT AWARDS

WASHINGTON — The Army has awarded a contract to Delco Division of General Motors Corp. for fire control equipment for artillery at a cost of $236,534. United Aircraft will supply the Army with propeller assemblies and control governors valued at $200,010. American Car & Foundry has received a government order for gasoline tank cars totaling $307,650.

Giddings & Lewis Machine Tool Co. has been awarded a War Department contract for boring mills at a cost of $128,988. General Electric and American Locomotive will furnish locomotives to the Panama Railroad Co. at cost of $438,750 and $221,600 rsepectively. Pioneer Instrument Co. will furnish the Army Air Corps with driftmeter assemblies totaling $573,990.

## CHRYSLER STRIKE SETTLEMENT NOT NEAR, BOTH SIDES INSIST

DETROIT — Federal conciliator Dewey's statement last week that the strike would be over in a few days was declared without foundation by union and Chrysler spokesmen. Mr. Frankensteen of the UAW-CIO stated definitely to *American Machinist* that negotiations had not proceeded to the point where any hope could be seen for an immediate settlement. Discussions with the management's conferees had been general, none of the several main points of contention had been disposed of. Union negotiators, said Mr. Frankensteen, were carefully going over certain clauses in the new contract to avoid ambiguity or lack of exact definition of the terms.

A corporation spokesman said there was a "good possibility" that the strike would be over the week of Nov. 12. His insistence that the corporation would not grant the union shop in any form nor permit the union a voice in production standards is construed as meaning that the union will get very little for its strike of more than five weeks. While time works in the favor of the company, it is unlikely that the union is ready yet to capitulate.

## DUTCH BUYING EQUIPMENT

NEW YORK—A Dutch mission is in the United States buying aircraft, machine tools and other products. Its address is Royal Netherlands Arsenal, 650 Fifth Avenue, New York City.

# WATCHING WASHINGTON

McGraw-Hill Washington Bureau

PAUL WOOTON, CHIEF

Administration's attention shifts to problems created by repeal of the arms embargo. More plans put forward to help keep the United States out of the conflict.

WASHINGTON—A "Priority Committee" will serve as bouncer to prevent the Allied customers from wrecking the newly opened United States Munitions Bar. The committee is an inter-departmental group, actually known as the "clearance committee." It was formed last summer at behest of the Administration, but it stresses "voluntary" coordination of foreign and domestic buying to the end that adequate production for home defense be assured. Veterans who engineered the same type of control during World War No. 1 are guiding the enterprise. War, Navy, Treasury, Justice and State Departments are represented; Col. Charles Hines is executive officer.

### Millions for Hemisphere Defense

An Army expansion program, designed to provide an adequate western hemisphere defense, and costing perhaps $1,650,000,000, will be placed before the forthcoming session of Congress, informed Administration quarters have disclosed. Tentative plan calls for a regular budget appropriation for the 1941 fiscal year of between $750,000,000 and $850,000,000. It will be bolstered by a supplemental program designed to assure an initial protective force of 600,000 men which could be put in the field immediately. In addition to increased manpower it would provide greater air strength, and more training funds, housing, equipment and supplies.

### Charge It!

Increased Army and Navy personnel and enforcement of the Neutrality law, as a result of War '39, will be charged to the public in the form of a $275,000,000 deficiency bill which President Roosevelt has already submitted to House Appropriations Committee. The Committee will begin consideration of the measure on Nov. 27 and Congress will get it soon after Jan. 3.

### Look for War Taxes

The metal-working industry major unit among war supply manufacturers, turns an attentive ear when Chairman Cooper of the House Ways & Means Committee announces its refusal to consider war profits tax measures, saying " . . . I see no occasion for the question of war profits tax arising now." The Treasury is studying hundreds of revenue-raising proposals, including many to squeeze the war supply business. But through war taxes are out for the present, the double motive: to prevent war by making it unprofitable, and to garner federal revenue, will be irresistible in the long run.

### Woo South American Trade

Officials of the State Department say privately that mere words about improving trade with South America have been supplanted by deeds. As a result, every one of the Latin countries is now favorable to the "Colossus of the North." But trade experts point out that the $100,000,000 credit to be extended to the Latins is mere chickenfeed. U. S. citizens have already invested $3,000,000,000 in productive assets down there, and in addition are holding one-and-a-half billion in Latin-American securities, 75 per cent of which are in default. Small amounts that can be loaned by Export-Import, RFC, and the Stabilization Fund, will have little permanent effect, our experts argue, unless they are used to facilitate return to a normal trading basis.

### WHERE THERE'S A WILL——

WASHINGTON — Balking of Roosevelt on the scheme to transfer U.S. line ships to the flag of Panama will not curtail exports of war supplies. Roosevelt's foot slipped pretty badly on that one—he started the thing with the Maritime Commission and then backed away when he found a hornet's nest. But his chief objective is not changed. The real desire it to provide plenty of bottoms to get airplanes and machinery, tools and supplies, to Britain and France. So it's just a question now of finding out some other way of doing it, and finding it without too much delay.

### Wrong Attitude?

Vigorous protest by the State Department, and threats of impeachment by Congressmen, held up the Maritime Commission's approval of transfer of eight United States Lines ships to the flag of Panama. Opposition said the shift would be a violation of the spirit and even the letter of the neutrality law just signed. This point was emphasized by the fact that there was no sale, no money, involved. Blunt critics said the transfer was the first step in turning over American shipping to the British despite the law.

### Aircraft Labor Resists

Administration spokesmen say that CIO will run into considerable trouble in its proposed drive to organize the aircraft industry. Union's headquarters here charge that aircraft manufacturers are hiring students from phoney aviation schools and working them for a time at "learner" wages, then discharging them. But federal officials answer that CIO is fabricating an excuse to cut in on what promises to be a juicy melon. They say War and Navy will appeal to Congress for protection against interference with national defense. CIO is particularly vulnerable at this time, charged as it is with harbouring disloyal aliens.

### Deal Closed

Sale of fourteen old Moore-McCormack vessels to Brazil had quite a history. First the Maritime Commission favored the deal as clearing the way for sale of new ships to the company. Then the war came, bringing prospects of better prices if the old ships were sold to England, so the Brazil deal cooled down. Last came neutrality and the drive for better relations and more trade with South America. So, the Government's best interests in the deal pointing South again, the sale was authorized to Brazil. But not before the Commission got Moore-McCormack's signature on an order for four new C-3 cargo vessels.

### Delve into Railroad Dilemma

Appointment of an industry committee of twelve members, headed by Frank P. Graham, president of the University of North Carolina, to recommend a minimum wage for the railroad industry was announced today by the Wage-Hour Division of Labor Department. This committee is authorized under the law to investigate conditions in the industry and to recommend to the Administrator the highest wage up to 40 cents which will not substantially curtail employment. Employees, employers, and the public are each represented by four committeemen.

## BRITAIN TO SPEND $300,000,000 FOR PILOT TRAINING IN CANADA

OTTAWA—British will spend $300,000,000 the next year for planes, airdromes and other facilities to train flyers in Canada from all parts of the Empire. The training planes will be purchased in the United States.

Most training centers will be in the western provinces partly because of the flat country and partly because of relative freedom from attack. About 50 training schools are planned. Trained flyers will be turned out in about six-months' time.

Canadian Associated Aircraft, central company representing six airplane makers, will be asked to produce a large number of bombers, perhaps as many as 1,000, as soon as a current order for the British is completed.

**Munitions Company Organized**

Marine Industries, Ltd., Sorel, has a large order for 25-lb. field guns for the British and is developing facilities for making war equipment for both England and France. The company and allied interests—companies controlled by Joseph Simard and associates—have incorporated all their holdings into a new company Sorel Industries, Ltd., with capital of $10,500,000.

Sorel Industries is authorized to operate in all branches of iron and steel, including arms, guns, munitions, explosives, ships, gun carriages, trucks, tanks, tractors, motor vehicles, airplanes and engines. It is now rushing to completion a plant for assembly of guns. It has the technical assistance of engineers from Schneider-Creusot in France.

Canadian-Ingersoll-Rand Co., Ltd., Montreal is reported getting into production of shells and other munitions for the British. John Inglis Co. is starting to make Bren machine guns.

**France Plays Minor Role**

France is not likely to look to Canada for as much help as the British. Prior to the war a bond issue sale in Canada totaling $50,000,000 to provide French credits for purchases was discussed. Lately it has been reported more likely that France would seek to set up additional credits in the United States, while arrangements with Canada would consist of revision of treaties to permit exchange of French goods for Canadian war materials.

Canadian government shortly will order building of ocean freighters, mine-sweepers and anti-submarine boats, business to be placed with Canadian yards. Most of Canadian lake boats are to be diverted to ocean trade, as soon as lake navigation ceases for the season, and U.S. boats are expected to handle the bulk of the lake traffic.

Rudy Arnold

**Jam Broken**—*Once more planes begin to move from crowded wharves as repeal of the arms embargo makes legal their export to belligerent nations. Problem now becomes one of finding ships to transport them*

### PREMIUMS FOR FASTER DELIVERIES

NEW YORK—The British and French have advanced about $5,000,000 to Curtiss-Wright and Pratt & Whitney Aircraft for expansion of plant capacities. This investment figures out as a premium on speed of delivery of airplane motors and does not mean equity in aircraft plants in this country, which is contrary to law.

Similar deals are reported in the making. The British soon will advance funds to U. S. firms to enlarge their training plane and engine manufacturing facilities.

## ATTEMPTS TO STABILIZE STEEL EMPLOYMENT TOLD BY FAIRLESS

WASHINGTON—United States Steel Corp. has done all in its power to stabilize employment for its employees and will continue to do so, but it will not attempt any untried theoretical plans for achieving such stabilization, testified Benjamin F. Fairless, president of the corporation, before the Temporary National Committee the past week. Mr. Fairless admitted that prices at which steel business is taken often are less than those of the published schedules.

Professor M. G. De Chazeau, University of Virginia, told the TNEC that the war is not likely to bring a substantial demand for steel and that current speculation probably will be disappointing.

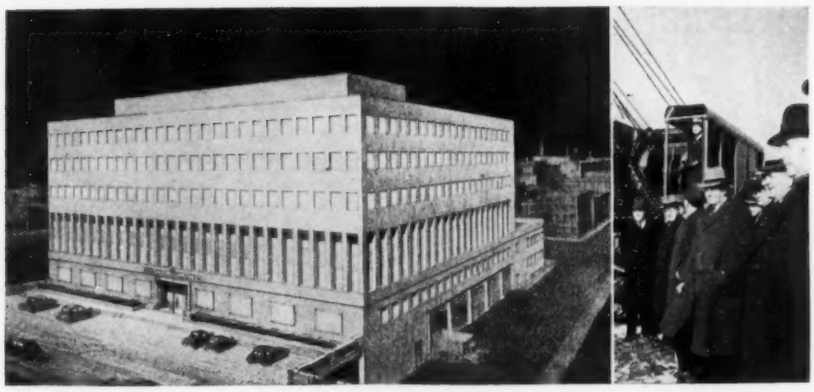
## NO OBJECTIONS EXPECTED TO TRANSFERS OF SHIP REGISTRY

WASHINGTON—Agricultural groups, fearful that the cash and carry requirement of the new Neutrality Law might mean that all available British and French ships might be needed to carry war materials, have received informal assurances that the U. S. Maritime Commission will interpose no objections to changes in the registry of American flag ships, provided assurance is given that the ship will be used in the United States trade.

Many American tankers have been operating under foreign flags for many years because of the additional costs associated with American registry. Most recent transfer is that of a group of oil tankers owned by the Standard Oil Company of New Jersey.

## CAR SHORTAGE DANGER SEEN; MORE STORAGE SPACE URGED

WASHINGTON—Army and Navy Munitions Board is urging manufacturers to provide adequate storage at their plants for materials. The point is that in the World War railroad freight cars were so extensively used for storage that acute car shortages were the rule. If the European war should result in a heavy load being thrown on the railroads, both the carriers and I.C.C. are determined not to permit an accumulation of freight. Cars will not be furnished for loading until it is certain they can be unloaded at their appointed destination.



**Going Up!**—*Here's how General Electric's $2,000,000 Chicago & Midwest headquarters will look when completed next fall. Occupying an entire Chicago block, the seven story building will house company activities now carried on in nine different buildings. Right, G. E. officials and visitors look on as vice-president W. O. Batchelder breaks ground for the structure*

## BUSINESS ITEMS

Allen Mfg. Co., maker of portable milking machines, has moved its plant from Madison, Wis., to De-Forest, Wis.

Aviation Mfg. Corp., Williamsport, Pa., is building a $250,000 plant at Nashville, Tenn. Factory will occupy some 125,000 sq.ft. of manufacturing space and will employ approximately 1,000 workers.

Bryant Chucking Grinder Co., Springfield, Vt., has awarded contract to the Austin Co. for design and construction of a $40,000 addition to its plant. The addition, which will provide 14,000 sq.ft. of floor space, is scheduled for completion in 45 working days.

Consolidated Steel Corp., Los Angeles, Calif., is planning a new manufacturing building covering an area of 70x273 ft.

Curtiss Aeroplane Div. of Curtiss-Wright Corp., Buffalo, N. Y., has let contracts for the construction of a new experimental laboratory to be used in the building of experimental planes. Plans for the new structure have been considered for some time, and the laboratory is said to be the first step in an expansion of the entire factory. Building will measure 116x162 ft.

General Tool & Die Corp., East Orange, N. J., has been formed to render cutting tool service in the eastern area. Vascaloy-Ramet carbide tools, "Rexalloy" tools, Crucible Steel Co. H.S.S. tool bits, and diamond tools are available. Organization also offers a "Tantung" hard facing service and engages in other engineering and educational activities.

Curtiss-Wright Corp., New York, N. Y., has purchased the hollow steel blade manufacturing division of the Pittsburgh Screw & Bolt Corp., Pittsburgh, Pa., which will be absorbed by the Curtiss Propeller Division at Clifton, N. J. Agreement followed completion of negotiations between the two organizations whereby Curtiss-Wright takes over the entire propeller blade division, equipment and patents of the Pittsburgh concern. Acquisition is said to provide Curtiss Propeller with manufacturing rights on the only hollow steel type aircraft propellers in service in the world. Addition of the Pittsburgh propeller blade manufacturing organization's facilities increases Curtiss Propeller's floor space approximately 60 per cent, this expansion marking an increase of some 800 per cent over the plant area occupied only 15 months ago.

Gunnison Mfg. Co., highway maintenance equipment manufacturer, is erecting a new plant at Baraboo, Wis.

Hanson-Van Winkle-Munning Co., Matawan, N. J., electroplating equipment manufacturer, has appointed H. E. Moyer, Los Angeles, Calif., as its sales representative.

Hayes Body Corp., Grand Rapids, Mich., is extending its operations to include manufacture of aircraft parts, ordnance, marine products, and armored tank and truck bodies.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., is reported buying the Cincinnati Planer Co., Cincinnati, Ohio. Deal is said to involve about $1,500,000. Giddings & Lewis is splitting its 100,000 shares of stock two for one. It is also floating 100,000 additional shares which will bring capitalization to $300,000. Details are expected to be concluded

## U. S. Government Contracts Awarded to Machine Tool Makers

(Other Metal-Working Contracts on page 966d)

| Contractor | Gov't Agency | Commodity | Amount |
|---|---|---|---|
| Aerial Machine & Tool Corp., New York, N. Y. | Air Corps | Special tools | $11,361 |
| Kay Products Co., Detroit, Mich. | Air Corps | Special tools | 11,486 |
| Hendey Machine Co., Torrington, Conn. | Navy | Lathes | 14,606 |
| Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. | Ordnance | Vertical presses | 27,750 |
| Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn. | Ordnance, Navy | Gun dri..ing machines, lathes | 98,111 |
| Wm. Sellers & Co., Philadelphia, Pa. | Ordnance, Navy | Boring machines | 121,672 |
| Boye & Emmes Machine Tool Co., Cincinnati, Ohio | Navy | Engine lathe | 11,053 |
| Henry Prentiss & Co., New York, N. Y. | Ordnance | Boring machines, grinders, miller | 142,930 |
| Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. | Navy | Boring machines | 77,728 |
| American Tool Works Co., Cincinnati, Ohio. | Ordnance | Engine lathes | 19,128 |
| Norton Co., Worcester, Mass. | Ordnance | Grinders, equipment | 86,043 |
| Blanchard Machine Co., Cambridge, Mass. | Ordnance | Surface grinders | 14,454 |
| Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio | Navy | Milling machine | 10,114 |
| Consolidated Machine Tool Corp., Rochester, N. Y. | Navy | Boring mill | 28,549 |
| Jones & Lamson Machine Co., Springfield, Vt. | Ordnance | Shell turning machines. | 49,428 |
| Davenport Machine Tool Co., Rochester, N. Y. | Ordnance | Automatic screw machines | 18,556 |
| Gisholt Machine Co., Madison, Wis. | Ordnance | Turret lathes | 11,861 |
| Warner & Swasey Co., Cleveland, Ohio. | Ordnance | Turret lathes | 13,842 |
| Hanson-Whitney Machine Co., Hartford, Conn. | Navy | Milling machines | 15,406 |
| Reed-Prentice Corp., Worcester, Mass. | Navy | Engine lathes | 13,800 |
| Bullard Co., Bridgeport, Conn. | Navy, Ordnance | Misc. machines | 84,125 |
| Brown & Sharpe Mfg. Co., Providence, R. I. | Navy | Milling machines | 21,370 |
| Monarch Machine Tool Co., Sidney, Ohio | Ordnance | Engine lathes | 52,052 |
| Bodine Corp., Bridgeport, Conn. | Ordnance | Drilling machines | 19,470 |
| Rockford Machine Tool Co., Rockford, Ill. | Navy | Planer | 24,436 |
| R. K. LeBlond Machine Tool Co., Cincinnati, Ohio | Navy | Engine lathes | 13,873 |
| Gallmeyer & Livingston Co., Grand Rapids, Mich. | Ordnance | Grinding machines | 10,204 |
| International Machine Tool Co., Indianapolis, Ind. | Ordnance | Turret lathe | 14,635 |
| Bryant Chucking Grinder Co., Springfield, Vt. | Ordnance | Grinders | 12,010 |

by the first of December. Price at which the new stock will be sold has not as yet been determined, but will probably be around $15 a share.

Hydro-Power Systems, Inc., Mount Gilead, Ohio, manufacturer of hydraulic machine drives, has transferred its general offices to Pittsburgh, Pa.

Lycoming Mfg. Co., Williamsport, Pa., aircraft engine manufacturer and a subsidiary of the Auburn Automobile Co., has been merged with the Aviation Corp.

Oak Mfg. Co., Chicago, Ill., manufacturer of equipment for the radio industry, has acquired the plant and equipment of the Reliance Die & Stamping Co. at a cost of $373,000.

Outboard Marine & Mfg. Co., Milwaukee, Wis., is planning to spend some $100,000 for new machinery for its Milwaukee plant, and about $50,000 for an addition to its refrigerator manufacturing plant in Galesburg, Ill.

Poly Choke Co., Hartford, Conn., will begin operations Dec. 1 in the Tariffville, Conn., plant of the Tariffvile Lace Co., manufacturing gun sub-assemblies.

Pullman-Standard Car Mfg. Co., Chicago, Ill., has acquired the Hammond chilled wheel foundry of the American Brake Shoe & Foundry Co. In exchange Pullman-Standard has given its foundry at Houston, Tex. Pullman-Standard is transferring its wheel manufacturing operations from Houston to Hammond, and American Brake Shoe is shifting its wheel operations from Hammond to Houston. W. R. BLUMFIELD, superintendent at Hammond, will be in charge at the Houston plant for American Brake Shoe.

John A. Roebling's Sons Co., Trenton, N. J., wire rope manufacturer, has moved its New York City office from 107 Liberty St. to 19 Rector St.

Spencer Lens Co., Buffalo, N. Y., held open house Oct. 26 at its recently completed mechanical parts plant.

Stone Mfg. Co., Chicago, Ill., has been appointed representative of the Warner Electric Brake Mfg. Co.

Timm Aircraft Corp., Los Angeles, Calif., will soon begin production on a high-speed airplane recently acquired from Hughes Aircraft Co. Timm Aircraft is also planning to make combat and pursuit planes.

Transcontinental & Western Air, Inc., has ordered five 4-motored "stratoliners" at a total cost of $2,200,000 from Boeing Aircraft Corp., Seattle, Wash. Scheduled for delivery some time between February and April, 1940, the ships will be 45,000-lb. planes for high-altitude transcontinental service.

Wheeling Steel Corp., Wheeling, W. Va., is planning a $1,000,000 butt-weld mill at its nearby Benwood mills.

**Nature's Own Daylight** *is used almost exclusively in this shop where many parts of the Cummins diesel injectors are held to tolerances of 0.0004 in. Usual shadow-producing cross members have been eliminated by rigid frame welded column construction. Structure was designed by the Austin Co.*

## PERSONALS

PROF. GEORGE ERLE BEGGS, Princeton University, has been elected chairman of the Engineering Foundation, research organization of the national engineering societies. O. E. BUCKLEY, executive vice-president Bell Telephone Laboratories, New York, N. Y., was chosen vice-pres.

FRANK R. BURNETTE has been named construction superintendent, and HOWARD L. DAWSON appointed engineer in charge of repairs, maintenance and lubrication, Carnegie-Illinois Steel Corp., Pittsburgh, Pa.

A. M. COX, president Pittsburgh Commercial Heat-Treating Co., Pittsburgh, Pa., has been elected president of the Metal Treating Institute. C. I. WESLEY, president Wesley Steel Treating Co., Milwaukee, Wis., has been named vice-president, while L. A. LINDBERG, vice-president Lindberg Steel Treating Co., Chicago, Ill., has been elected secretary-treasurer.

TERRY FISHER has been appointed Northern Indiana territory salesman, Cutler-Hammer, Inc., Milwaukee, Wis.

J. M. FLOYD, a vice-president of the A. O. Smith Corp., Milwaukee, Wis., has been elected to the board of directors, succeeding CARL C. JOYS, JR., resigned.

D. E. GAMBLE, for eleven years vice-president and general manager of the Borg & Beck division of Borg-Warner Corp., Chicago, Ill., has been named president of the Pump Engineering Service Corp., Cleveland, Ohio, manufacturer of aviation fuel, vacuum and hydraulic pumps, valves and related accessories. RALPH H. MCQUAT, general manager, will also serve as vice-president of the recently acquired subsidiary.

JOSEPH G. JACKSON has been appointed vice-president in charge of manufacturing, the Edward Katzinger Co., Chicago, Ill.

HENRY A. LARDNER, since 1913 vice-president of the J. G. White Engineering Corp., New York, N. Y., has been elected president of United Engineering Trustees, joint organization of the four national societies of civil, mining and metallurgical, electrical and mechanical engineers.

HENRY D. ROLPH, former general manager of the Velbert Div., Yale & Towne Mfg. Co., Stamford, Conn., has been appointed director of export sales, with headquarters in New York City.

A. E. SHELTON has been named president and a director of the Menasco Mfg. Co., Los Angeles, Calif., aircraft engine manufacturer. Mr. Shelton was formerly head of the purchasing department of the Lockheed Aircraft Corp., Burbank, Calif.

HAROLD J. STEIN, research engineer with the manufacturing department of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has been appointed director of research, chemistry and metallurgy.

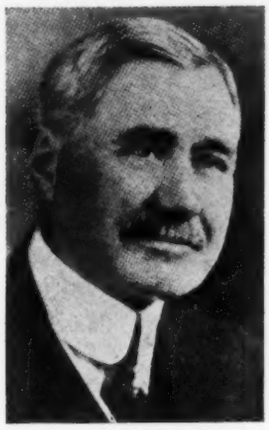
JOHN F. TINSLEY, president Crompton & Knowles Loom Works, Worcester, Mass., has been elected president of the Associated Industries of Massachusetts, succeeding WILLIAM M. RAND, vice-president Monsanto Chemical Co.

H. G. WALTER, vice-president Gerrard Co., Chicago, Ill., manufacturer of wire strapping machines, has been elected president. H. R. MORRISON has been named vice-president in charge of sales.

GEORGE J. WATSON has been appointed plant engineer of the American Bridge Co., Elmira Heights, N. Y., succeeding HENRY W. PRESTON, who has retired after some 50 years of service with the company.

JOHN W. YOUNG has been elected president and general manager of the Hayes Body Corp., Grand Rapids, Mich. to succeed the late EDWARD J. CONNOLLY. Mr. Young has resigned as executive vice-president of Breeze Corp. and as president of Federal Laboratories, Inc.

## OBITUARIES



ARTHUR L. HUMPHREY

ARTHUR L. HUMPHREY, retired president and chairman of the board, Westinghouse Air Brake Co., Pittsburgh, Pa., died Nov. 1 at his home in Edgewood. He was 79 years of age.

Born in Buffalo, N. Y., in 1860, Mr. Humphrey began his career as a farmer and railway machinist, joining Westinghouse Air Brake in 1903 as its Western manager. Two years later he became general manager with headquarters at Pittsburgh, and in 1910 was named vice-president and general manager. Three years later he was made a director, and in 1919 was elected president. This position he retained until 1932, when he became executive director. Following year he became chairman of the board of the company and of its subsidiary, the Union Switch and Signal Co., in which capacity he served until he retired in 1936.

JAMES CAREY, 85, former president Carey Machinery & Supply Co., Baltimore, Md., died Oct. 28 of a heart ailment.

JOHN W. DALMAN, 66, retired head of the Dalman-Childs Co., Chicago, Ill., manufacturer of railway equipment, died Oct. 30 at his home in Racine, Wis.

CHARLES DAPP, 66, since 1927 president U. S. Slicing Machine Co., Laporte, Ind., died Oct. 21.

PAUL G. HOPPE, 47, vice-president and treasurer Kempsmith Machine Co., West Allis, Wis., died Oct. 25 in a Milwaukee hospital following a short illness.

H. P. PREIS, 50, president H. P. Preis Engraving Machine Co., Newark, N. J., died Nov. 2.

ARTHUR A. TISDALE, 65, former Western region general manager of the Canadian National Railways, died Oct. 31 in Winnipeg, Manitoba.

## Exports of Machinery During September, 1939

| | September 1939 | August 1939 | September 1938 |
|---|---|---|---|
| Electrical machinery | $8,062,687 | $8,696,318 | $7,299,055 |
| Power generating machinery (except automotive and electric) | 1,113,665 | 1,560,056 | 913,622 |
| Construction and conveying machinery | 1,767,562 | 2,450,330 | 1,813,839 |
| Mining, well and pumping machinery | 4,500,147 | 5,613,157 | 4,918,233 |
| Power driven metal working machinery | 9,539,355 | 9,870,911 | 8,144,947 |
| Other metal-working machinery | 410,246 | 439,774 | 250,610 |
| Textile machinery | 819,714 | 753,699 | 338,863 |

## Exports of Metal-Working Machinery During September, 1939

| | | | |
|---|---|---|---|
| Engine lathes | $418,944 | $511,526 | $395,204 |
| Turret lathes | 746,052 | 847,477 | 426,372 |
| Other lathes | 279,041 | 451,747 | 224,765 |
| Vertical boring mills and chucking machines | 498,728 | 345,972 | 330,760 |
| Thread cutting and automatic screw machines | 459,927 | 568,977 | 292,039 |
| Knee and column type milling machines | 644,152 | 378,887 | 230,445 |
| Other milling machines | 1,169,595 | 1,307,131 | 924,441 |
| Gear cutting machines | 222,090 | 236,851 | 218,750 |
| Vertical drilling machines | 111,165 | 27,610 | 442,245 |
| Radial drilling machines | 142,659 | 74,503 | 9,881 |
| Other drilling machines | 214,367 | 139,089 | 236,253 |
| Planers and shapers | 142,932 | 338,547 | 282,446 |
| Surface grinding machines | 190,523 | 179,209 | 264,047 |
| External cylindrical grinding machines | 192,638 | 184,612 | 302,788 |
| Internal grinding machines | 294,353 | 465,997 | 227,059 |
| Tool grinding, cutter grinding, and universal grinding machines | 278,275 | 436,371 | 308,370 |
| Other metal-grinding machines and parts | 471,071 | 425,013 | 360,639 |
| Sheet and plate metal-working machines and parts | 384,713 | 612,220 | 693,492 |
| Forging machinery and parts | 74,971 | 359,648 | 812,251 |
| Rolling mill machinery and parts | 1,038,370 | 755,812 | 861,779 |
| Foundry and molding equipment and parts | 216,405 | 118,476 | 109,393 |
| Other power-driven metal-working machinery and parts | 1,348,384 | 1,103,455 | 591,528 |

## Other Metal-Working Machinery

| | | | |
|---|---|---|---|
| Pneumatic portable tools | $106,746 | $146,365 | $93,938 |
| Other portable and hand or foot-operated metal-working machines and parts | 119,006 | 133,609 | 63,879 |
| Chucks for machine tools | 28,042 | 21,906 | 13,105 |
| Milling cutters, machine-operated threading dies and taps, and similar machine-operated metal cutting tools | 55,040 | 73,228 | 43,030 |
| Other metal-working machine tools and parts | 101,412 | 64,666 | 36,658 |

## MEETINGS

AMERICAN ENGINEERING COUNCIL. Annual meeting, Mayflower Hotel, Washington, D. C., Jan. 11–13.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Winter convention, New York, N. Y., Jan. 22-26.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Annual meeting, Blackstone Hotel, Chicago, Ill., Jan. 16–18.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Sixtieth annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Dec. 4–8.

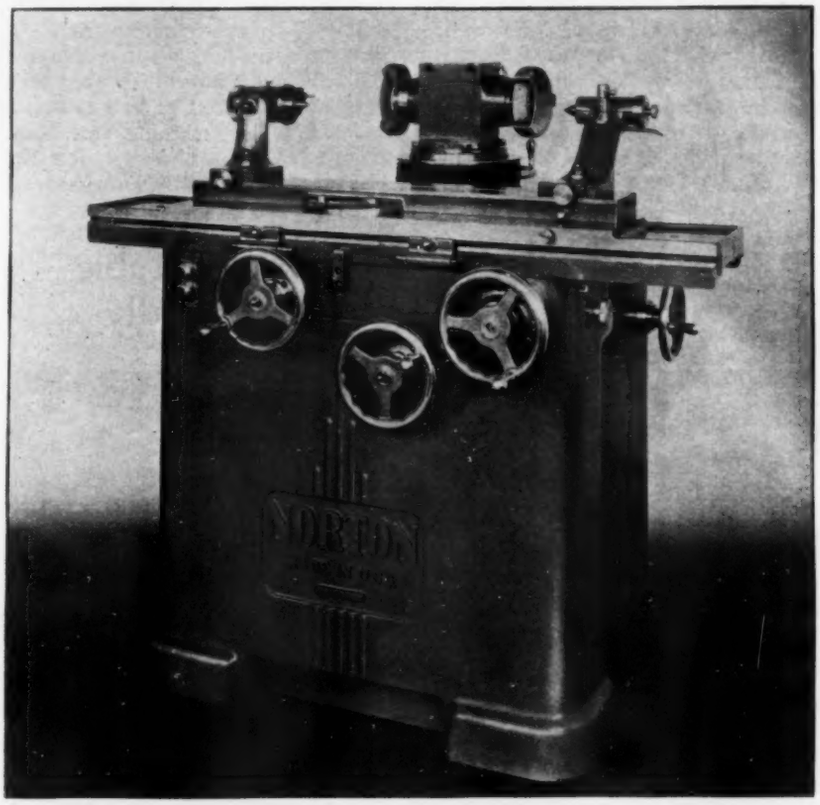
MOTOR & EQUIPMENT MANUFACTURERS ASSOCIATION. Annual meeting, Blackstone Hotel, Chicago, Ill., Dec. 12.

NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting, Hotel Waldorf-Astoria, New York, N. Y., Dec. 7–9.

NATIONAL STANDARD PARTS ASSOCIATION. Annual meeting, Sherman Hotel, Chicago, Ill., Dec. 8–9. A.S.I. Show, Navy Pier, Chicago, Dec. 11–16.

# SHOP EQUIPMENT NEWS

## Norton No. 2 Cutter and Tool Grinder Has Anti-Friction Table and Steel Ways



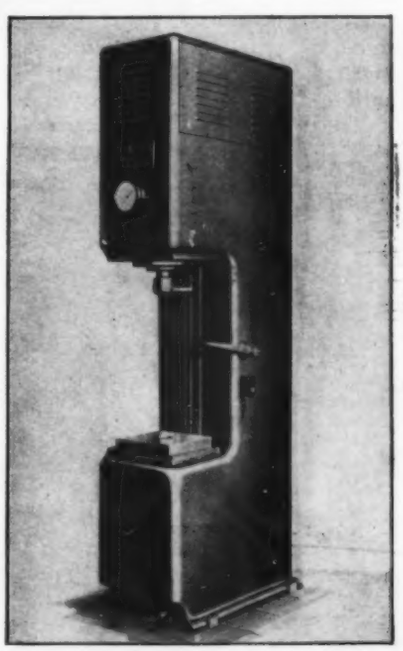

One of the interesting features of the new No. 2 cutter and tool grinder announced by Norton Co., Worcester, Mass., is the anti-friction table which runs on balls held in a chain-like container. All of the balls of a set are selected for size. Hardened steel ways are used, and an adjustable braking device permits creating a "drag" on the table, or locking it securely in a specific position. The cartridge-type ball bearing wheel spindle is driven by a 1-hp. motor carried on the lower end of a heavy column. Graduations on the wheel-head permit setting the spindle at any angle in a horizontal plane.

Being a wheel slide type of machine, rather than a saddle type, the distance from the front control handwheels to the work center permits comfortable operation from the front of the machine. The work table never overhangs the front of the base and, consequently, is firmly supported at all times. Supplementary handwheels at the rear permit operation from either side, as well as the front, depending on the nature of the job and the operator's particular preference. Toe holds at the front and each side of the base permit standing close to the machine with ease.

The machine is available either as a plain cutter grinder or as a universal machine, the only difference being that more equipment is supplied with the universal model. Included as equipment with both models is a universal work head which takes milling cutters having the standard No. 50 (3½ in. per ft.) taper. Supplied with it are reducing collets for Nos. 12, 10, 9 and 7 B & S and No. 2 Morse Tapers. Also supplied is a universal-type left-hand footstock which will take No. 9 B & S tapers. Both the universal workhead and the left-hand footstock are provided with clearance angle setting dials. In addition to the plain equipment, the universal model includes attachments for internal, surface, cylindrical and gear cutter grinding. Other attachments are available for hob, form, face mill and long reamer grinding. The machine weighs between 2,200 and 2,500 lb. depending on the equipment, and requires a 56 x 72 in. floor space.

## Denison Hydraulic Press Is Self-Contained

Type DLAC-1 vertical hydraulic presses offered by the Denison Engineering Co., 236 N. Water St., Columbus, Ohio, are offered for straightening, assembling, broaching and pressing operations. Available with capacities of 5, 15, 25 and 50 tons, these presses have a maximum stroke of 26 in., and a maximum



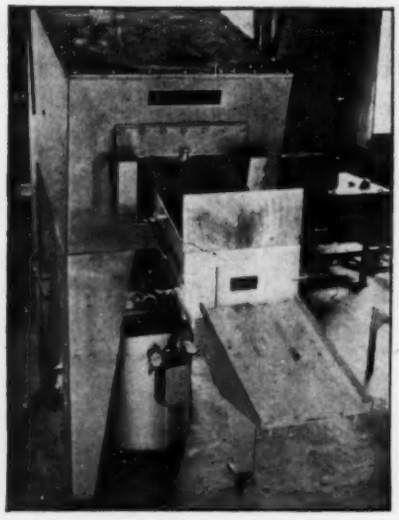
vertical opening of 29 in. Depth of throat from center line of ram is 8 in. for the two smaller sizes, and 10 in. for the larger sizes.

Frames of these presses are of welded steel construction and ample toe space is provided for the operator at the front. The press cylinder assembly is flange-mounted in the upper portion of the frame. Also located in the upper part of the frame, behind the cylinder, is the hydraulic pump which is integrally flange-mounted on its driving motor. Under the motor compartment is the oil reservoir.

## Westinghouse Furnace Uses "Ammogas"

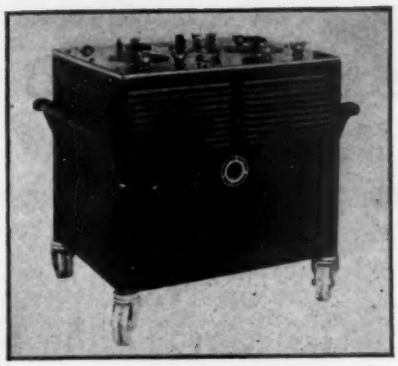
Damage to tool steels by oxidation, decarburization, distortion or cracking during hardening is said to be eliminated through the use of an electric furnace employing "Ammogas" atmosphere developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The "Ammogas" atmosphere is so inactive with carbon that a soft skin does not form on 1.5 per cent steel soaked in it at 1,850 F. for an hour. The composition of this gas needs no adjustment to the requirements of the steel being hardened, and its strongly reducing character aids in the hardening of stainless steel without tarnish.

The furnace used is tilted at an angle of 20 deg., with the entrance at the low end. As "Ammogas" is lighter than air, this prevents contamination of the pure gas atmosphere in the furnace, even with the entrance open. Special radiation shields keep the furnace temperature uniform. Operation of the oven is said to be foolproof and preheating of work is unnecessary. Cooling is accomplished more rapidly in the gas atmosphere than in air. From one to three hours is required for heat-treatment, varying with the type of work. Carburizing power of "Ammogas" can be controlled without changing the reducing power.

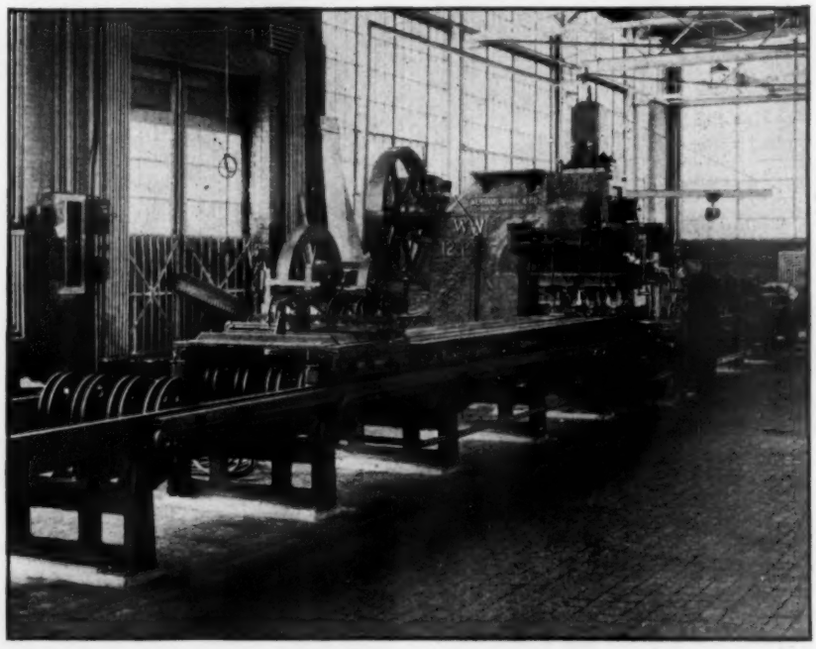


## Hampton Arc Welder Has 500-amp. Capacity

The Hampton Electric Tool Co., 700 Walnut St., Edgewood, Pittsburgh, Pa., offer the 500-amp. capacity No. E2F a.c. arc welder which can be used by two operators simultaneously at from 30 to 280 amp. each. By simply shifting a copper bar on the top of the welder, it can be operated by one man at from 30 to 560 amp. Electrodes ranging from $\frac{1}{16}$ to $\frac{1}{2}$ in. diameter inclusive can be used, making it possible to weld successfully thin sheets as well as heavy castings. The machine measures 20x26x35 in. and weighs 460 lb. It is mounted on ball bearing casters.



## Large Beam Punch and Spacing Table Punches Angles and Plates Rapidly



The accompanying illustration shows a recently installed beam punch and spacing table built by Williams, White & Co., 3rd Ave. at 8th St., Moline, Ill., for high production of punched angles and plates, especially angles used in oil well derricks, power line towers and bridge work. This machine has capacity for a minimum of 4x4 in. to a maximum of 8x8x$\frac{3}{4}$ in. angles, four at one pass.

Two carriages are used, one to push the angles through the tools at the start, the second to pull them through to the finish. This feature is claimed to insure speed and accuracy. The table is designed for the operator to do the spacing of the angles, moving a set of sliding tools front to back to meet various gage lines. A rack at the front of the machine, just in front of the operator supports the templet which can be marked lines on wood or drilled 3 in. wide steel strip.

The push and pull carriages are moved by a rack, with arrangements for the operator to engage or disen-

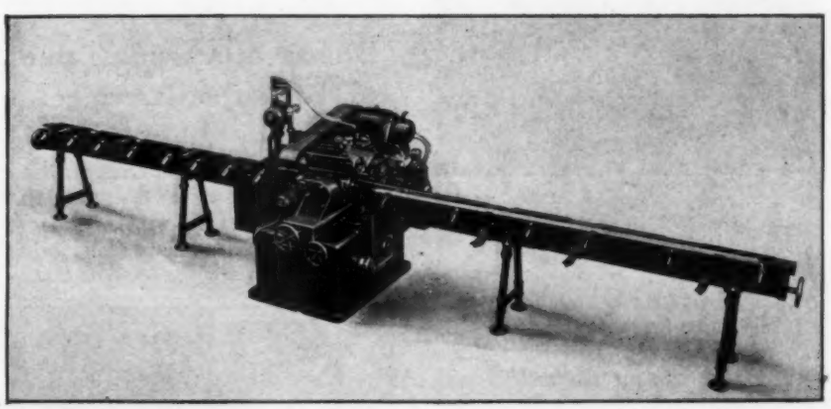
gage either carriage by two air valves. The operator also engages and disengages the gripper jaws. All punching tools are gagged, so that one leg of angles can be punched on the two front sets of tools and the opposite leg on the rear tools. In this manner two angles are completed at one pass after the first two legs are finished. The equipment is so designed that all controls for operation, including clamping material, loading the end carriage, punching, operating gags and spacing, are within easy reach of the operator without his changing position.

## Malcus Centerless Grinders Feature Improved Bar Feed Tables

Offered in the United States by Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y., the "Malcus" centerless grinding machines made by Malcus Holmquist, A.B., Halmstad, Sweden, now are available with three types of feed tables for grinding bars and tubes. The machine shown is a No. 4, Model MC1 grinder equipped with a No. 301 bar feed table. This table is made in 6½ ft. sections which can be connected to form the length desired. It is not motor-driven, has adjustable support rolls which run in ball bearings, and can be adjusted vertically by handwheel. This table is particularly suited for light bars and tubes.

The heavier No. 302 feed table, also not motor-driven, is suitable for bars up to 2 in. maximum diameter and for tubes up to 4 in. outside diameter, both in maximum lengths of 16 ft. Design of the No. 302 feed table is similar to the large No. 303 motor-driven table which is intended for solid bars up to about 4 in. diameter and is supplied in two sizes, for 16 and 23 ft. bar lengths. This table stands independently at each side of the machine and it may be moved up to or away from the machine as required. Like the other two tables, this table is adjusted for height by a handwheel. An advantage of the No. 303 table is that the feed speed of the driving and bearing rolls corresponds to the speed of the regulating wheel. Moreover, the feed speed can be adjusted at any time while the machine is running, and the bar may be directed forwards or backwards on the table as desired. All of these tables are furnished with infeed chutes for bars under ¾ in. diameter.

Outstanding features of the "Malcus" centerless grinders include: (1) grinding wheel as well as regulating wheel have bearings on both sides, (2) grinding wheel and regulating wheel are both adjustable on long slides against the work support, (3) direct electric drive and regulation of the feed wheel is claimed to insure rapid and efficient control of the grinding, (4) grinding wheel can be dressed automatically from profile guides, as can the regulating wheel. The Model MC1 grinders are available in three sizes, with capacity for grinding diameters of 4, 6, and 6⅞ in. with new wheels. The No. 4 machine shown uses 16-in. diameter grinding wheels up to 10 in. wide. Regulating wheel is 10¼ in. in diameter and can be as much as 10 in. wide. Grinding wheel speed is 1700 r.p.m., while the regulating wheel speed can be adjusted from 0 to 300 r.p.m. A 25 hp. motor is required.

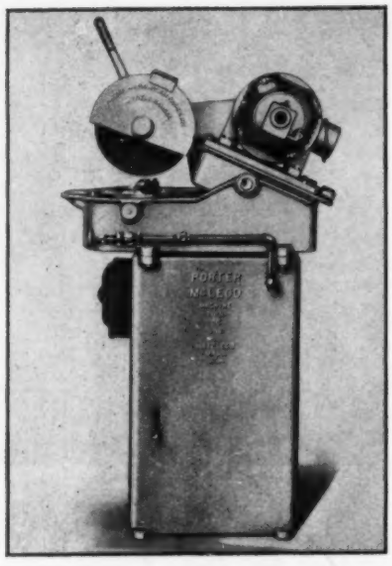


## Lincoln Arc Welder Has 200-amp. Capacity.

An improved 200-amp. arc welder of the "Junior" type, with a range for many welding applications ordinarily associated with larger welding equipment, has been announced by the Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio. Of the motor-generator d.c. arc type, this machine will weld virtually all metals and alloys, and do hard-facing work. Speed of operation is high and the machine can be used with either bare or shielded arc type electrodes. It has a current range from 60 to 250 amp. A special feature on this small machine is the dual continuous control which permits independent adjustment of current and voltage, giving complete and separate control of arc heat and arc penetration.

## Porter-McLeod Offers Abrasive Cut-Off Unit

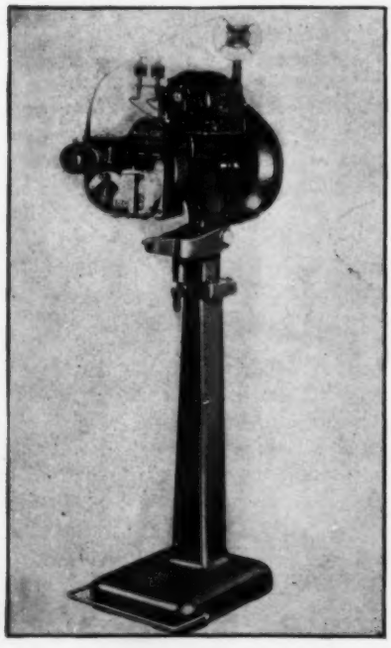
Available either in a bench or pedestal type, the 1-in. capacity wet abrasive cut-off machine developed by Porter-McLeod Machine Tool Co., Inc., Hatfield, Mass., is provided with a turntable which may be set in 5 deg. steps, in either direction, up to 45 deg. for angle cutting. In the pedestal model shown, the lower part of the pedestal forms a coolant tank with capacity for 8 gal. The bottom of this tank is inclined and is provided with a clean-out door in which there is a drain plug for drawing off the coolant. On both the bench and pedestal type machines, the coolant is brought in through the side of the base and is directed into a chamber located directly under the turntable. From this point it rises through an orifice



located in the center of the turntable to each side of the work being cut. The 1½-hp. motor drives the wheel spindle through three V-belts.

## Seybold Stitcher Joins Steel Sheets

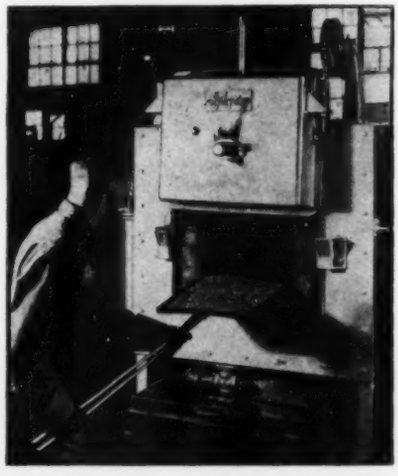
The "Seybold - Morrison" steel stitcher, developed by the Seybold Div., Harris-Seybold-Potter Co., Dayton, Ohio, is available in two standard sizes, with 8 and 20-in. throats, and is recommended especially for tacking fiber strips to various sections of sheet steel bodies. These machines also are used for joining sheet steel parts for other than automotive applications. These



machines will drive wire stitches of No. 18 or 20 wire through 0.060 in. of steel. In fastening various materials to sheet steel, a total thickness of ¾ in. can be stitched. Stitches can be driven within ⅜ in. of an upward rising flange, front or back, and within ⅛ in. of downward projection. Minor variations in thickness of stock can be handled without adjustment of the arm. Special arms are available for certain applications.

## Lindberg Furnace Uses "Hydryzing' Process

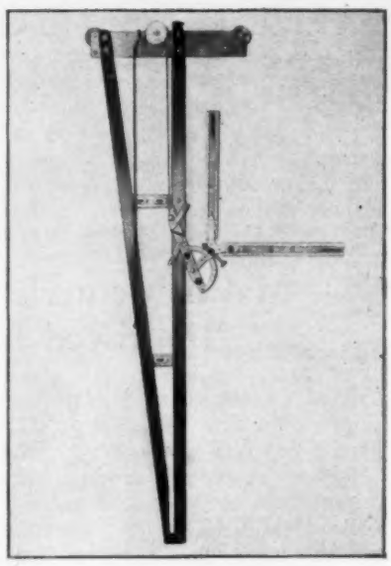
Bright hardening of small parts is performed economically in the "Hydryzing" process furnace developed by Lindberg Engineering Co., 229 N. Laflin St., Chicago, Ill. In this furnace, the work is loaded onto the hearth in the normal manner, and the furnace atmosphere is said to



protect the parts against either pick-up or loss of carbon. No pickling or cleaning operations are necessary, because the surface of "Hydryzed" work remains bright and clean. This process also can be used for annealing non-ferrous metals, and is said to be particularly effective for annealing copper.

## Drafting Machine Of Stainless Steel

Comprising a vertical T-square combined with a vertically slidable protractor carrying interchangeable scales and guided by a track, the stainless steel drafting machine offered by Emmert Mfg. Co., Waynesboro, Pa., can be adjusted to position the protractor to any position on the drawing



board. These machines are available in eighteen sizes for drawings up to 132 in. wide by any desired length. The three smaller sizes, for 24x36-, 30x42- and 36x48-in. drawings, can be used on vertical or vertically-inclined boards. The larger units are made especially for vertical movable balanced boards. The protractor is fitted with a worm and worm wheel adjustment. The steel track is fastened on the top of the drawing board, is adjustable both vertically and horizontally, and is equipped with sensitive stops at either end.

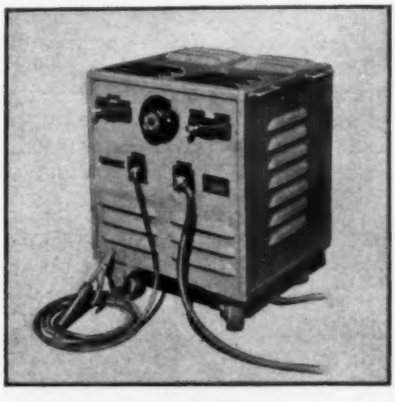
## Dietzgen Drawing Table Folds for Carrying

The "Handy" drawing table developed by the Eugene Dietzgen Co., 2425 Sheffield Ave., Chicago, Ill., can be lifted easily with one hand. It folds up and unfolds like a camp

stool and sets almost automatically to the right drawing position. There is adequate knee room, and a pencil and instrument rack is placed across the top. This table folds to 3 in. thick and stows away easily against the wall or in a closet. The 20x26 in. board is attached permanently to the supporting frame.

## Allis-Chambers Welder Used With Low Currents

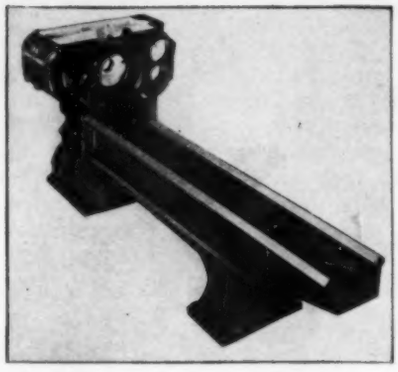
The "Weld-O-Tron" electronic arc welder for precision work offered by Allis-Chalmers Mfg. Co., Milwaukee, Wis., can be used to weld with currents as low as 5 amp., using newly developed 1/32 and 3/64 in. electrodes. Steels, stainless steels, and other metals lighter than approximately No. 18 gage can be



welded readily. The heart of this portable welder is a multiple-tube polyphase mercury vapor rectifier unit. The readily accessible controls and terminals are of the dead front type, and are located on the control panel. Two of them are simple two-way switches, one for current range selection, and the other for reversing polarity of the tube terminals. A handwheel, with easily read dial, provides fine adjustment of the welding current.

## W. & S. Improves Lathe Bed Design

A type of construction increasing the strength and rigidity of cast iron alloy lathe beds as much as 30 per cent has been announced by the Warner & Swasey Co., Cleveland, Ohio. Now standard on all but the smallest of the company's machines, the new construction features diagonal ribbing similar to bridge girder design, in-

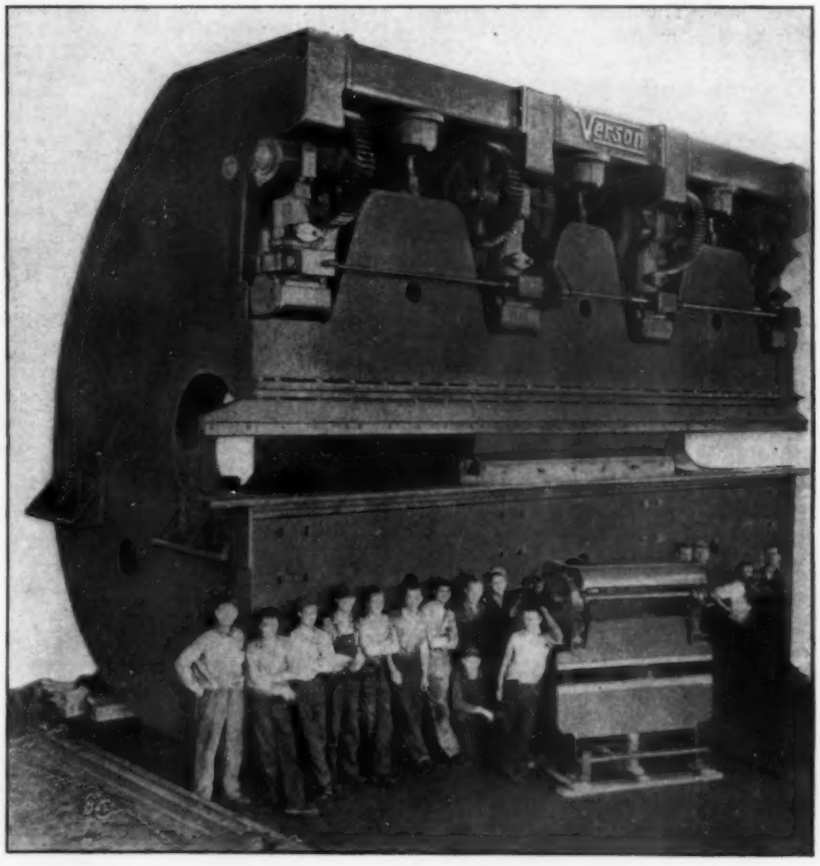


stead of the conventional box type ribbing. In addition, all stiffening sections are now on the outside walls of the bed. This is said to give greater freedom from twist and vibration, and to make it easier for the chips to clear through the opening and fall into the pan. Diagonal ribbing extends into the section below the headstock, giving, together with an outer tie member between head and bed, considerably increased strength in this region. Total weight of the casting has not been increased.

## Verson Mechanical Press Brake Bends 5/8-in. Steel Plate 33 ft. Long

Said to be the largest mechanical press brake yet made, this 1,000-ton capacity brake built by Verson Allsteel Press Co., 9306 S. Kenwood Ave., Chicago, Ill., is to be used for fabricating steel plate for barge sections. It is capable of bending $\frac{5}{8}$ in. steel plate 33 ft. long to a 90 deg. angle at one stroke. Both the bed and the ram are 33 ft. long and the throat is 60 in. deep. Die space is 36 in. and stroke is 5 in. The press can be operated at either 6 or 12 strokes per minute. Slide is air counterbalanced and has motorized adjustment. It is equipped with direct-reading indicators registering to 0.0001 in. to facilitate die setting.

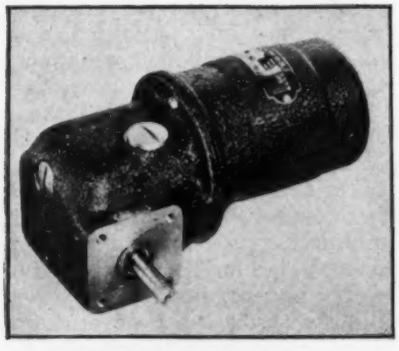
Total weight of this press brake is approximately 440,000 lb.—each housing weighs 44,000 lb. One man can operate the press, which has remote control for adjusting the slide; continuous operation; automatic stop on top; "inching" control for setting dies; emergency stop effective at any position of the stroke up or down. A quadruple drive is provided for



the main shafts, while the back shaft is double geared. Seven flat cars were required for the complete shipment of the machine to the purchaser.

## Dumore Type KD Motor Double-Reduction Geared

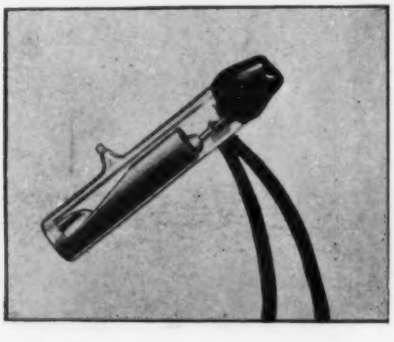
The Type KD heavy-duty, double-reduction geared motor developed by the Dumore Co., Racine, Wis., is suitable for many applications. It has a lower power winding than other motors in the K series, the output at the armature shaft being approximately $\frac{1}{10}$ hp. at 7,000 r.p.m. Output shaft speeds range from 11 to 116 r.p.m. at



no load and from 6.83 to 70.7 r.p.m. at full load. The motor is mounted by means of a machined face, a pilot boss and four tapped holes around the output shaft. The output shaft may be brought out horizontally to the left or parallel to the armature shaft if desired.

## "Kon-nec-tor" Switch Has Delayed Action

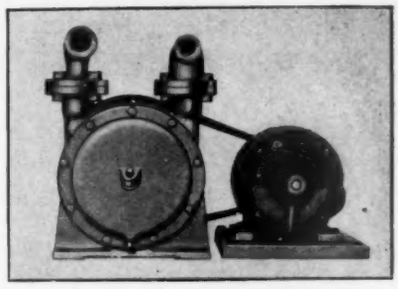
An addition to the standard line of "Kon-nec-tor" mercury switches developed by the lamp department of the General Electric Co., Schenectady, N. Y., comprises units obtainable with time-delay intervals from



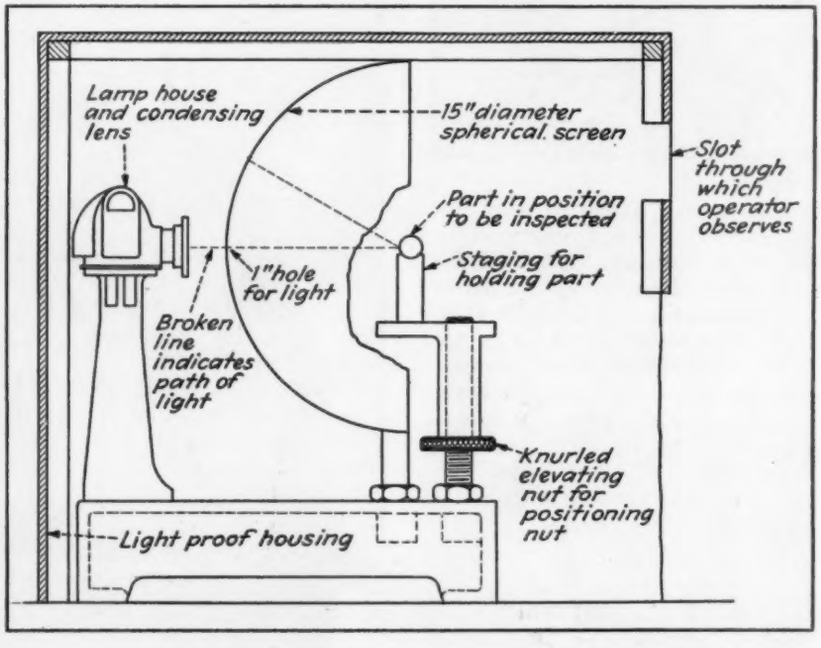
$\frac{1}{2}$ to 10 sec. for circuit-closing or for circuit closing. These units are of approximately the same size and external design as conventional mercury switches. Simply and economically mounted, they can be operated either mechanically by means of a lever or cam action, or electrically by means of a solenoid. The delayed-action characteristic of these switches is obtained by the restricted flow of mercury through a small orifice at the bottom of the metal chamber inside the switch.

## Pump Designed for Corrosive Liquids

Corrosive liquids don't have a chance to attack the metal parts of a pump introduced by Huber Pump Co., 90 West St., New York, N. Y. This unit, designed to handle chemicals, corrosive and abrasive liquids, employs an entirely new principle of operation. In it, vacuum first sucks the liquid into flexible tubing, then pressure forces it out on the discharge side. The pump tubing, rubber or Neoprene, as dictated by the liquid being handled, is confined within a casing which prevents the tubing from expanding beyond its normal diameter and length, even under high pressures. Liquid is literally squeezed out of the tubing by pressure applied progressively from the intake to the discharge end. This pressure is applied by an eccentric rotor revolving within a circular compressor ring. This ring is so adjusted that it com-



pletely closes the tubing which is forced against it by the progressive action of the rotor. The tubing has a heavy elastic wall construction which enables it to spring back to its original form immediately after the rotor releases it, thereby creating a high vacuum on the suction side. No stuffing box of any kind is required.


Lamp house and condensing lens
15" diameter spherical screen
Slot through which operator observes
Part in position to be inspected
Staging for holding part
1" hole for light
Broken line indicates path of light
Knurled elevating nut for positioning nut
Light proof housing

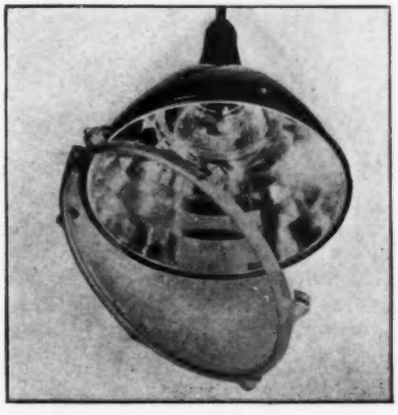
## J. & L. Comparator Inspects Spherical Parts

The Jones & Lamson Machine Co., Springfield, Vt., has developed a comparator especially for inspecting spherical surfaces, such as those of balls used in precision ball bearings. Hitherto, the determination of the size and nature of flaws on highly finished surfaces of this type has necessitated the use of expensive instruments and highly skilled operators. This comparator makes the inspection of these surfaces a very simple, yet exact procedure without the necessity of highly skilled operators, and with great economy of

time. The accompanying drawing illustrates the method of inspection. An enlarged true image of the surface being inspected is projected onto a concave hemispherical screen, which measures 15 in. at its maximum diameter. Magnification naturally depends on the size of the work, a ¼ in. diameter ball, for example, is magnified 60 times, and the instrument may be used effectively to inspect spheres up to 1½ in. in diameter.

## Benjamin Steelite Units Completely Armor-Clad

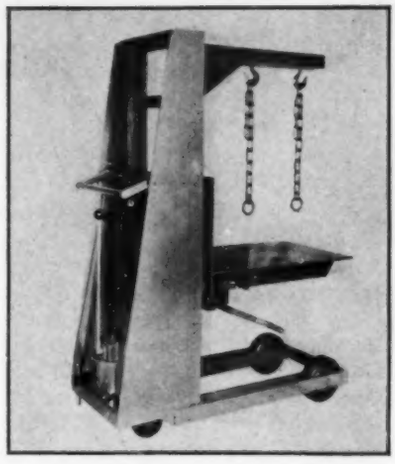
The heavy-duty "Steelite" armor-clad lighting unit, offered by Benjamin Electric Mfg. Co., 120-128 S. Sangamon St., Des Plaines, Ill., incorporates a steel housing and a "Herculite" heat, cold and impact resistant glass. Dust-tight and vapor-proof, the reflector interior is sealed against dirt as a solution to the



problem of proper maintenance in locations where smoke, grime, fumes, steam and moisture are present. These units take lamps from 750 to 1500 watts. Two types of Alzak aluminum reflectors are available; one highly polished for high mounting installations, the other having an etched surface for medium mounting heights.

## Lyon Hydraulic Truck Handles Heavy Dies

An adaption of the cantilever-type truck with an hydraulic elevating table, this die-handling truck offered by Lyon Iron Works, Greene, N. Y., is furnished with a die separating and turning device, and a special adjustable clamp for holding various size dies. A winch for pulling dies on

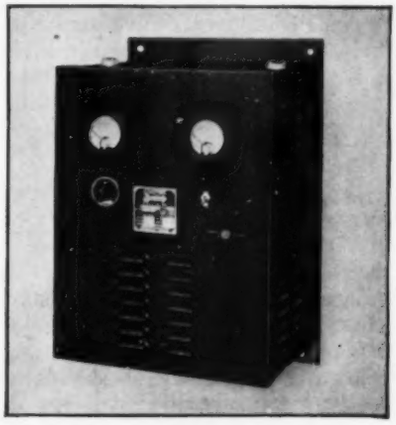


and off the table is mounted on the under side of the table. This winch is operated by a removable hand crank.

The truck is of the castered steer type and is equipped with a brake to hold the truck in position. It is furnished with a two-speed hydraulic pump, the low speed for elevating heavy dies and the high speed for lighter dies or when elevating the table empty. The truck shown is of 2,000-lb. capacity with a 24x36-in. table having a lowered height of 15 in., elevated height is 45 in. Other sizes can be furnished.

## Dry Plate Rectifier Employs Selenium

A new rectifying medium—selenium—is employed in the Type SR series of Fansteel-I. T. & T. rectifiers developed by the Fansteel Metallurgical Corp., North Chicago, Ill. This material permits using fewer plates for a given power output. Efficiency is said to be affected very little by temperature, making blowers or special cooling equipment unnecessary. Output is lowered only slightly by age, and overloads as high as 75 per cent can



be handled for several hours without deterioration.

These rectifiers are manufactured to order in full-wave bridge or half-wave types for practically any desired d.c. voltage and current output. The rectifier elements, transformer, fuses and controls are mounted in ventilated steel cabinets. Unit is said to be suitable for practically any industrial d.c. requirement where other types of rectifiers or motor-generator sets are commonly used.

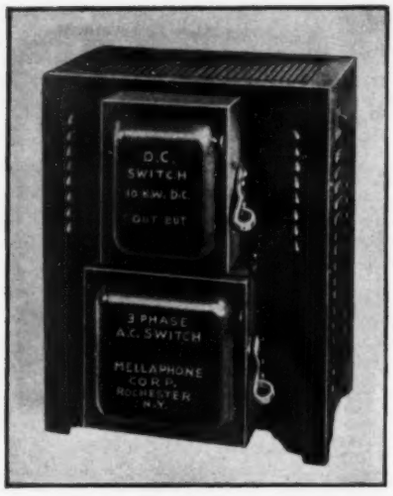
## Buehler Specimen Cutter Uses Abrasive Wheel

Specimens up to 1¼ in. in diameter can be cut off quickly in the No. 1100-AB specimen cutter developed by Adolph I. Buehler, 228 N. LaSalle St., Chicago, Ill. The sample is held by adjustable clamps on a self-adjusting device which maintains radial and axial alignment. A stream of water is directed against the wheel

during the cutting operation. This water can be supplied from regular water connections, or a tank is available if running water connections cannot be made. A safety stop provides for convenient positioning of samples, while the motor is running without danger of contact between the cutting wheel and the specimen. The Type AB sludge trap provided with this machine has a sliding drawer to collect and conveniently remove sludge, allowing the water to drain off and thus prevent clogging of drain.

## Rectifier Permits Fine Tool Speed Changes

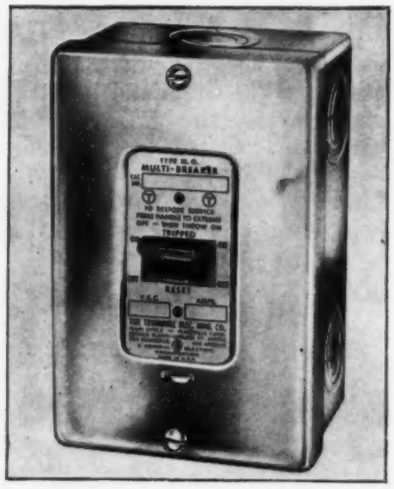
A 10-kw. 3-phase rectifier for supplying d.c. power for machine tool motors where fine speed adjustment is necessary has been developed by the




Mellaphone Corp., Rochester, N. Y. Of the electronic type, this rectifier contains no moving parts, but uses six inexpensive tubes for full wave rectification of all three phases of the a.c. line, resulting in an output voltage having very little ripple. Because of the inherently good voltage regulation of the mercury vapor tubes, the voltage remains practically constant regardless of the load. Low internal resistance of these tubes provides high efficiency. Rectifier operates from 3-phase, 220-volt a.c. and delivers 10 kw. at 230 volts d.c. Taps are provided for line voltage adjustments of from 210 to 230 volts.

## New Multi-Breaker Handles Light Loads

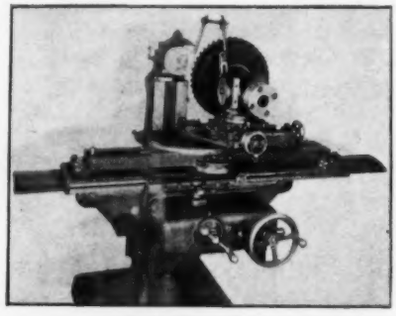
Trumbull Electric Mfg. Co., Plainville, Conn., has made available the new Type "MO" Multi-Breaker to give low-priced short circuit and overload protection to small motor, lighting and appliance circuits. Supplied in 15-, 20-, and 25-amp. capacities, it can be used within its rating for any application where fuses were previously installed. Models can be furnished for flush or surface mounting.




## Grinding Attachment Lengthens Cutter Life

A radius grinding attachment which has been developed by the Covel Mfg. Co., Benton Harbor, Mich., provides a fast, accurate means of grinding a radius on the corner of the teeth of a face milling cutter. While this attachment is primarily made to mount on the company's No. 91-A universal cutter and tool grinder, it can be used on almost any grinder having a flat top table from 5 in. to 6 in. wide, longitudinal movement of a few inches, and a cup grinding wheel from 3 to 5 in. in diameter.

In the operation of this attachment, the face milling cutter to be ground is mounted in the spindle of the top part and then the corner of the teeth

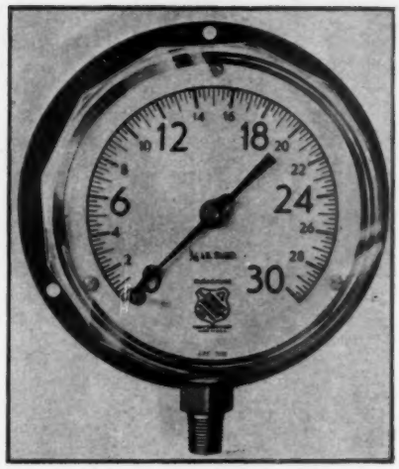


to be ground is lined up in the 90-deg. notch in the guide post. This guide post puts the corner of cutter to be ground on the exact center of the pivot point. Operator then adjusts the two slides to the amount of radius he requires. Spindle of the top part is adjusted to give proper clearance on face of cutter. Base is graduated for an accurate reading of the swinging motion.

Capacity: face mills from 2 to 14 in. in diameter, end mills with ball ends from $\frac{5}{8}$ to 2 in. in diameter, radius concave or convex from 0 to 2 in. each, swing, 100 deg. Weight of attachment is 200 lb.

## Plastic Gage Cover Eliminates Breakage

Announced by the Ashcroft American Gage Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn., this transparent gage cover is said to eliminate the breakage of glass fronts on




indicating gages. Replacing the conventional glass and gage ring, this part is formed of a non-breakable crystal-clear plastic in the shape of a cover which threads onto the gage case. It makes the dial of the gage easier to read, and renders the case moisture proof and dust proof. It is available for all $4\frac{1}{2}$- and 6-in. phenolcase "Duragauges."

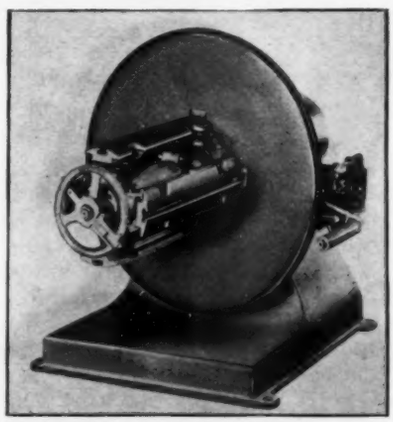
## Fisher "Carbanalyzer" Determines Carbon Content

The Fisher Scientific Co., 711–723 Forbes St., Pittsburgh, Pa., offers the "Carbonalyzer" for rapid, accurate determination of the carbon content of steel. It employs exact electrical means based on the principle that the carbon content of steel and its magnetic permeability vary in a known manner. This instrument was developed by the Research and Development Div. of the Jones & Laughlin Steel Corp. The instrument is portable, has no delicate parts which require special care, and is simple in operation. Analyses can be conducted

in about 5 min. The instrument operates over a range of 0.05 to 1.50 per cent carbon content and is sensitive to a change of ± 0.005 per cent.

## Littell Centering Reel Handles 4,000-lb. Coils

The No. 40 automatic centering reel for handling coils weighing up to 4,000 lb. and up to 20-in. width, offered by the F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill., is self-centering and is particularly suitable for unwinding and rewinding light-gage material. It can be used in

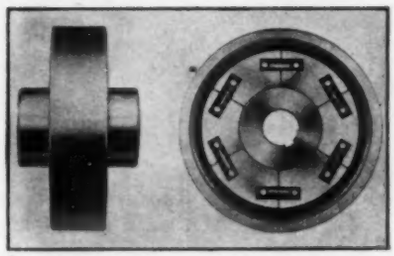


combination with punch press feeds, or with slitters. The winding drum is expandable readily from 14½ to 16½ in. Chairs can be provided for handling larger coils. The reel is mounted on an all-steel welded base and is equipped with a 3-hp. motor. Weight is about 2,250 lb. When this unit is used for unwinding material to slitters, the motor drive is omitted and the reel is equipped with a large brake.

## Dawes Automatic Clutch Has Only Two Main Parts

The "D-E" automatic centrifugal clutch developed by Dawes Equipment, Inc., 2280 Penobscot Bldg., Detroit, Mich., consists of two main parts—the housing drum or driven member, and the expansion body or driving member. A steel cover plate held in position by means of a lock ring seals the clutch mechanism against dust. The expansion body consists of six metal segments interconnected by tension springs and operating on individual posts extended radially from the driving hub. When at rest the clutch is disengaged.

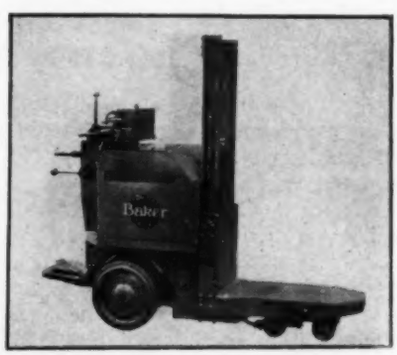
These clutches can be built to en-



gage smoothly at any desired speed and for any horsepower. Most industrial requirements are served by six standard sizes covering a range from 1 in. up to and including 2⅜ in. shafts for capacities up to 125 hp. The "free wheeling" effect of this smooth-acting clutch is said to cushion shocks, thus cutting down starting demand loads. It functions both as a clutch and as a flexible coupling on direct drives.

## Small Baker Trucks Use Standard Parts

Although built to the dimensions of the usual "midget" types of industrial trucks, the Series F "Hy-Lift" trucks offered by Baker-Raulang Co., 2168 W. 25th St., Cleveland, Ohio, contain units identical with those in standard Baker trucks up to 5-ton capacity. These trucks are built with capacities of 1½ and 2 tons, the latter having a full compensating, tandem trailing axle and the former a single trailing axle. Standard platforms are from 18 to 36 in. wide, 48 to 72 in. long, and 7 in. high in the lowered position. Non-telescoping lifts are available up to 10 ft., and a



telescoping feature may be had for extreme lifts with a low over-all height. One variation of these two trucks is a low-lift model in which the platform lifts to 23 in. above the floor, giving ample clearance for skid legs on a ramp. These trucks incorporate recent developments in hydraulic lifting equipment, in which the hoist controller operates both the pump motor and the valve to the lifting jack cylinder, and lowering is by gravity with the speed under the complete control of the operator. Travel speeds are up to 6 m.p.h., and lifting speeds are up to 20 ft. per min. With the standard 18x48 in. lift platform, these trucks will operate in intersecting aisles only 56 in. wide.

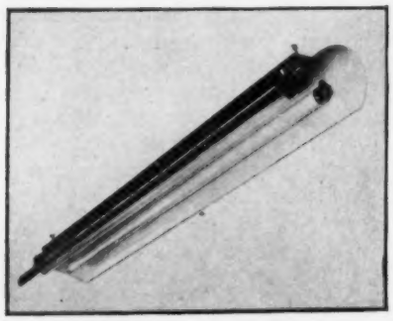
## Welding Gun Extension Speeds Spot Welding

Designed and built by the Progressive Welder Co., 701 Piquette Ave., Detroit, Mich., a combination lightweight hydraulic spot welding gun and aluminum current carrying extension arm has simplified the problem of spot welding in relatively inaccessible locations. Two aluminum sections comprising the handle con-

duct current from the cable connection at the input end to a similar connection at the gun end. In addition to carrying the welding current, each extension handle element is hollow to permit supply and return of water for cooling the gun and welding points. Pushbutton control is provided at the operator's end of the unit.

## Fluorescent Unit Runs on Shop Supply

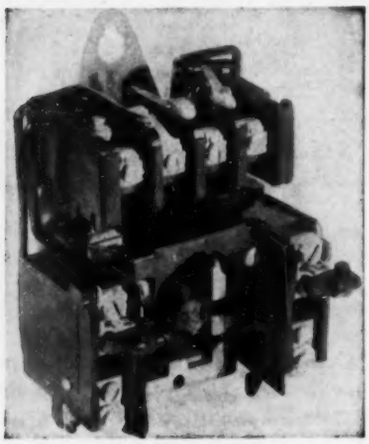
A complete fluorescent lighting unit which plugs directly into any standard 60-cycle a.c. socket has been announced by the Hygrade Sylvania Corp., Salem, Mass. Known as the Hygrade HF-100, it is sold complete with two standard 40-watt 48-in. fluorescent lamps. Two types are available, one for operation on 115 volts, the other for 230 volts. Advantages of the unit include power factor cor-



rection, virtual elimination of stroboscopic effect, and ease of installation. Over-all dimensions of the unit are 57x9x7 in. It is said to produce several times the light, one-quarter the radiant heat and one-half the total heat developed by incandescent light sources.

## Magnetic Switch Starts Small A.C. Motors

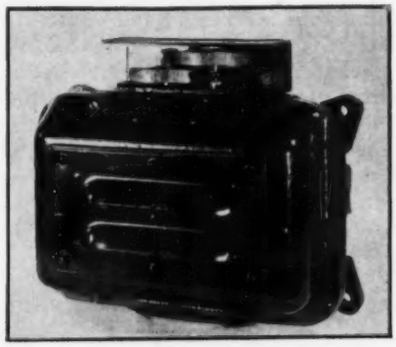
The Size O magnetic switch made by General Electric Co., Schenectady, N. Y., is available in a number of forms for use with single-phase motors up to 1 hp., 110 volts and 1½ hp., 220 volts, or polyphase



motors up to 1½ hp., 110 volts and 2 hp., 220–600 volts. It is made in two, three and four-pole forms in general purpose, dust-tight, and water-tight cases. Contacts are of fine silver and are easily removed for inspection or replacement.

## New Planer Switches Operate at High Speed

Types S-24 and S-26 planer limit switches offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., have been made large and heavy to permit them to stand up successfully under the high-speed operation that is becoming common practice. Both the foreward and reverse switch elements are mounted within a single heavy cast iron inclosure, and the steel operating cams have been so located as to make possible the operation of the planer with a minimum length of stroke. The switch inclosure is oil-tight, but is ventilated through screened openings to prevent corrosion of the parts caused by the d.c. arc at the contacts. The contact

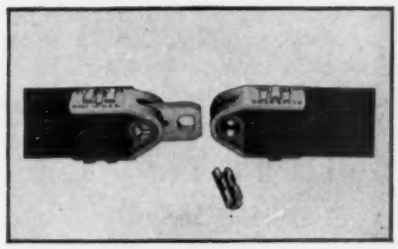


units are double-break silver contacts which are cam operated. Ball bearings, sealed against dirt and permanently lubricated, are provided for both operating shafts and also for the snap-action spring operating device. The switch has been designed so that even should the snap action springs break, the switch will be positively operated by the cam. A single unit switch of similar design also is available for single direction operation.

## New V-Belt Fasteners Join Fabric Core Belts

The "Alligator" V-belt flexible fastener announced some time ago by Flexible Steel Lacing Co., 4607 Lexington St., Chicago, Ill., now is available for B, C and D section V-belts. The use of this new fastener is limited to crosswoven fabric core V-belts, and should not be applied to cord-type belts. With these fasteners it is possible to install and maintain matched lengths of V-belts on multiple drives without the need for tearing down the installations. It is possible, also, to make up a wide variety of multiple V-belt drives from stock coils.

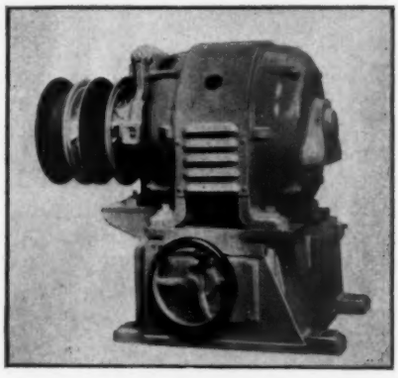
This fastener consists of two die-formed steel end plates, two bushings, two two-piece rocker pins, and special nails. The end plates are held



onto the ends of the belt by special formed flat nails. These nails enter the belt with their flat sides parallel to the belt lengths, leaving the burden-bearing fibres intact. The die-formed end plates are narrower than the belt, so that no metal comes in contact with the sheaves.

## Variable Speed Drive Uses Multiple Belts

Multiple belts are used on the variable speed motor drive developed by the U. S. Electrical Mfg. Co., 200 E. Slauson Ave., Los Angeles, Calif. Speed changes on the unit are effected by turning the handwheel which shifts the motor on its base and thus moves the yoke actuating the pulleys. An efficient lubrication

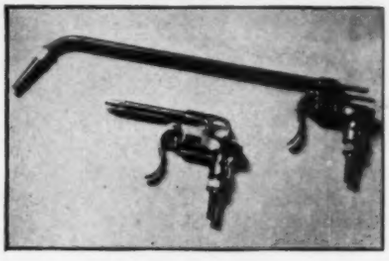


system provides a thorough method of greasing the pulley sliding fits. Belt may be tightened or loosened without shifting the entire base by adjusting a setscrew which turns the eccentric bushing located at the pivot point of the shifting yoke arm.

## Ace Air Blow Guns Easily Controlled

Two improved air blow guns have been developed by the Ace Valve Co., 50 Beekman St., New York, N. Y. The liquid and air cleaning gun, shown at the top in the accompanying illustration, is made with a bent or straight 12-in. long nozzle and has

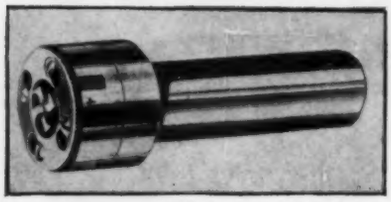
fittings for standard ¼-in. hose. The nozzle of this gun consists of two tubes, so that the air flowing through the outer tube draws the cleaning fluid through the inner tube and drives it through the nozzle as a spray. This gun should be used on air lines of 50 lb. per sq. in. or more pressure for best results. The air-controlled blow



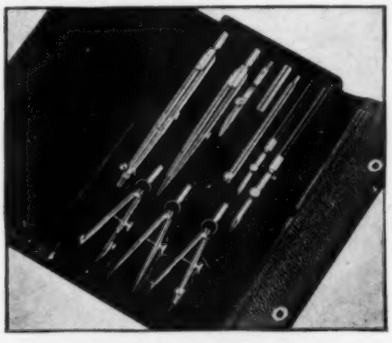
gun valve shown below is available with three-, six-, or twelve-inch nozzles. Lever trigger and valve construction of this gun permits close control of air pressure. These guns are made to fit standard ¼- or ⅜-in. air hose.

## Geometric Die Head Has Adjustable Chasers

The No. EJ5 four-chaser solid adjustable die head, developed by the Geometric Tool Co., New Haven, Conn., provides for adjustment of the chasers within the die head, thus allowing production of the exact fit desired. The chasers may be removed quickly for resharpening by removing the face plate which is held in place by a bayonet lock. Projection chasers of high speed steel are furnished as standard, thus facilitating shoulder threading, and at the same time bringing the



chasers out beyond the face plate for ease in setting up. Only 1 in. in diameter, this tool weighs less than 5 oz. complete with chasers. It is equipped with a non-releasing floating shank, thus no holder is necessary. It is built in one size only, with a threading range from No. 0 to 10 in threads up to 100 per inch.



## K. & E. Instruments Are Machine Made

American made "Minusa" drawing instruments, offered by Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J., have a slender "rounded taper" construction. Hand fitting of all moving parts is said to insure smooth, even action. Except for the hand-fitting operations, these instruments are made by machine production methods.

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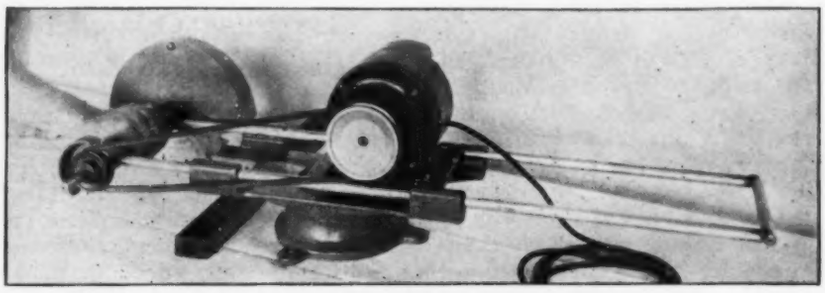
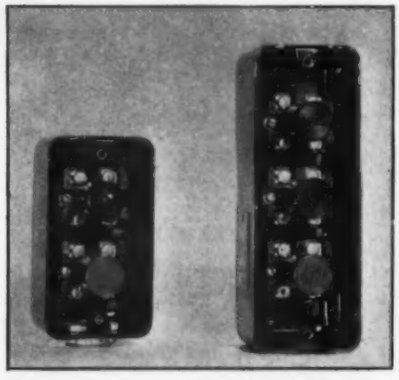
## "E-Z Slide" Saw Is Portable

The "E-Z Slide" cut-off saw developed by the Louis Zaler Mfg. Co., 669 North Ave., Dunnellen, N. J., is a compact and easily portable swing saw. It is especially recommended for crating departments where several machines can be operated from any light socket. Wide materials, such as wallboard, plywood, composite materials and light metals may be cut accurately to any angle desired from 90 to 45 deg. Saw is powered with a ½-hp. motor and with an 8-in. saw blade will cut 2x15-in. material. Sliding carriage consists of two ¾-in. ground steel bars which slide in the machined ways of the frame. Net weight is 50 lb.



## Pushbuttons Designed For Pilot Circuits

A line of standard-duty pushbuttons for a.c. and d.c. pilot circuits and special applications, supplied for surface and flush mounting, has been announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Double-break, silver-plated copper contacts give long life, and drawn steel cases and molded covers eliminate sharp corners and give a permanently attractive finish. Shrouded for protection against accidental operation, the large buttons are easily pressed, even with gloved hands. Clearly marked terminals and knock-



outs in top and bottom make for easy installation. One double-circuit, momentary-contact spring-return button unit is available for auxiliary control in machine tool and similar operations. A two-button station is provided for use with reverse starters, while a three-button unit is furnished where forward, reverse and stop operations are required. Other members of the line are watertight and flush mounting stations, units with rotary selector switches, and stations with safety latch to protect against closing of circuit by another operator or from another control point.

## "Mechani-Seal" Bearings Seal Without Friction

The Fafnir Bearing Co., New Britain, Conn., has made commercially available a new bearing seal design known as the "Mechani-Seal." Unusually

high sealing efficiency is said to be achieved, without the disadvantages of any contact material whatsoever, and with no tendency for the seal to generate friction or to increase bearing wear. The seal is an integral part of the bearing itself, which requires a housing of only simple design with a minimum of machining. Two steel plate seals, widely separated to form a trap, serve as the innermost members, both attached to the outer bearing. Another steel plate, pressed on the bearing inner ring, acts as a slinger when this inner ring is rotating.

## Spray Gun Feed Cover Fits Original Can

The Master No. C-3 "Econ-O-Can" syphon feed cover offered by the Burning Brand Co., 1400–16 W. Fulton St., Chicago, Ill., for use in conjunction with Master spray painting equipment, comprises a syphon cover for one-quart friction top cans. Use of this device is claimed to effect considerable savings of paint, since the various colors can be kept in their original cans while being sprayed. Additional empty cans to fit the unit can also be supplied.

## Fluorescent Lamp Fixture Makes Installation Easy

The "Stream-Liter" porcelain enamel single-reflector type twin lamp unit offered by the Benjamin Electric Mfg. Co., 120–128 S. Sangamon St., Des Plaines, Ill., has been designed particularly to make available to general overhead illumination of industrial interiors the advantages of fluorescent lighting, such as greatly reduced heat and glare, high efficiency and remarkable daylight color properties. This is made practicable by the higher light output of the new 48-in., 40-

watt lamps. These fluorescent lamp units have a widespread distribution of light, comparable to dome-type incandescent lamp reflectors. The deep shape of its reflector provides adequate shielding, while the combination of diffusive properties of the porcelain enamel reflector and the low surface brightness of the lamps provides unusually soft, glareless lighting. The light output of the two fluorescent lamps is said to approximate that of an ordinary 200-watt incandescent lamp.

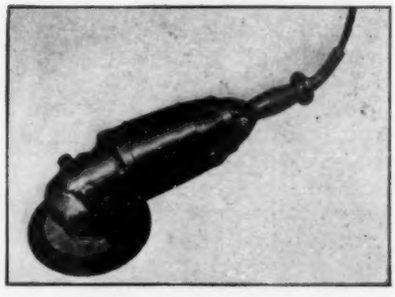
## Lightweight Truck Used Where Loads Are Limited

A "Sit-Down" center-control fork truck of lightweight construction, which is suitable for use in multi-storied buildings where floor load limitations are in effect, is being offered by the Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill. The truck, designated as Model A-1360, has a 2000-lb. load capacity. The driver sits in a center-control position where he has good vision and is well protected.

The truck is available with or without a tilting feature, which provides 3 deg. forward tilt and 10 deg. rearward tilt, and is furnished with either high lift or telescopic lift. The high-lift truck elevates to 63 in. while the telescopic elevation is to 115 in. with an over-all collapsed height of 83 in.

## Mall Heavy-Duty Sander Balanced for Easy Use

The streamlined, heavy-duty "Mall-sander" introduced by the Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill., is light in weight and is balanced for easy operation with either right or left hand. It has a high-torque, cool running motor, spiral bevel chrome nickel alloy steel gears, and light-weight housings. Standard equipment includes a 7 in. diameter

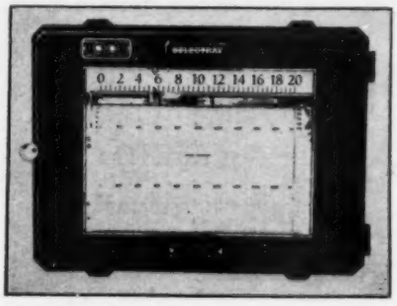


backing pad and abrasive, a special spindle lock that fastens the spindle when removing or applying the abrasive disk, and 15 ft. of cord and plug. Motor is of the universal type for a.c. or d.c. operation. No-load speed is 4,200 r.p.m. Net weight, 15 lb.

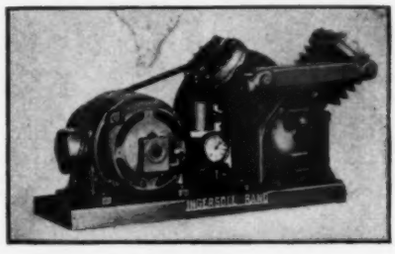
## Throttling Controller Has No "Dead Zone"

Designed especially for throttling electric heat, a "Celectray" recorder-controller offered by C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y., provides means for obtaining accurate control of electric furnaces and ovens without the use of

rheostats or transformers. The instrument is said to have no measurable controller "dead zone" and will hold a steady temperature instead of the oscillating temperature of "on-off" or two position control. Operation and mechanical construction of this re-



corder-controller is similar to the "Celectray" line of potentiometers, with the exception that by reciprocating the control contacts throttling regulation of electric heat is obtained. Adjustment for load error is provided.



## Small Air Compressors Use "Finger Valve" Design

The Ingersoll-Rand Co., Phillipsburg, N. J., has developed a line of industrial compressors and vacuum pumps in sizes ranging from ¾ to 5 hp. as part of its line of Type 30 compressors. These compressors, embodying a simplified "finger valve" construction, form only part of the complete range of Type 30 compressors, which are built in sizes up to 15 hp. for pressures as high as 1,000 lb. They are available with or without drive, receiver-mounted or bare.

## Ross Operating Valve Controlled by Pilot

The Ross Operating Valve Co., 6488 Epworth Blvd., Detroit, Mich., has developed an all-air pilot-controlled valve which can be arranged for semi-automatic, full-automatic, or remote control of double-acting air cylinders. This control arrangement is said to be especially suited to

manufacturing operations calling for a series of successive operations which require rapid and accurately timed progressive movements, such as for spot or seam welding. The valve, which is fully air operated, is actuated by pilot controls. These pilots are made in various designs for hand, foot or mechanical action, with a push, cam, toggle or other desired movement.

## Beach Paint Spray Gun Applies Heavy Materials

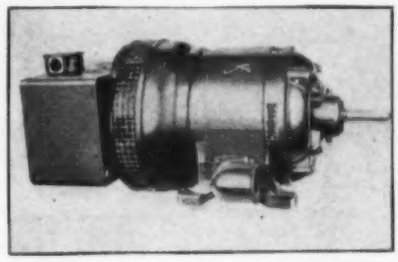
Although of light weight, because of its one-piece Dowmetal body, the Model BC Series 12 paint spray gun offered by Willard C. Beach Air Brush Co., Second and Warren Sts., Harrison, N. J., is said to pneumatically apply heavier and more viscous materials without greatly increasing the pressure or volume of air used, and with no decrease in speed, than previous models. By controlling air motion at various pressures, improved atomization takes place and the controlled air motion holds the

spray together between the nozzle and the surface. This reduces mist, fog, fumes and "blow-away" to a minimum. It is claimed that this gun will air-spread a uniformly smooth coating on a surface rapidly.

## "Ajusto-Spede" Motor Offered by Louis Allis

The "Ajusto-Spede" motor announced by the Louis Allis Co., 133 E. Stewart St., Milwaukee, Wis., is a combination of an eddy current clutch and a standard constant-speed a.c. squirrel cage motor. There is no mechanical contact between the driving and driven members of the unit. Speed and torque variations are obtained by controlling the magnetic excitation of the clutch, thereby obtaining any desired slip.

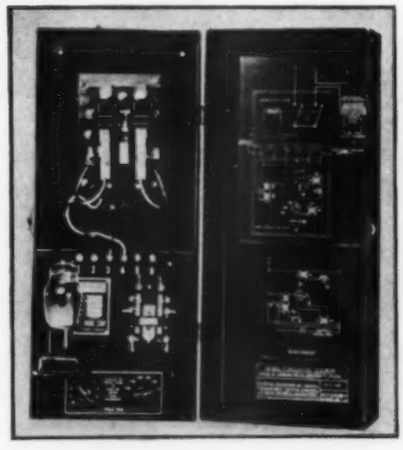
Some of the functions performed by this unit without jar, shock or stress on any of the driven parts



are: gradual or quick acceleration of load, rapid intermittent starting and disconnecting of load, absorption of torsional impulses and vibration. The unit can be operated continually at low speeds without overheating. Remote control is available. Units of 30 hp. and smaller are available with a stepdown transformer and rectifier unit as the source of d.c. excitation for the clutch.

## Timing Control Offered for Manually-Operated Welders

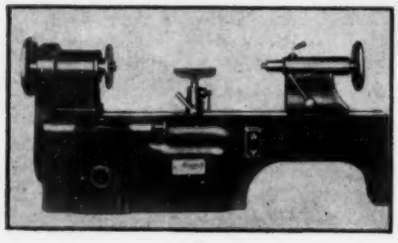
A combination weld timer and contactor to provide positive weld timing control for virtually any manually-operated 1 to 15 kva. spot welder and accurate enough to permit welding of stainless steel, aluminum and brass has been announced by Weltronic Corp., 2832 E. Grand Blvd., Detroit, Mich. Available for either 110, 220 or 440 volts and 25, 50 or



60 cycles, the new time-contactor unit, known as the Model No. 90-53, is adjustable in one-cycle steps over the standard 1 to 60 cycle timing range.

## Wood Turning Lathes Use Variable Transmission

American Saw Mill Machinery Co., Hackettstown, N. J., has announced a line of "Monarch" infinitely variable speed wood turning lathes. Transmission is a positive drive unit, capable of an infinite number of speeds from any desired maximum down to zero. Transmission and motor are mounted below the lathe bed, with the spindle driven by a multiple V-belt from the transmission. Standard spindle speed range is from 0 to



2,400 r.p.m., with other speed ranges available if desired. Spindle speed is controlled by means of a conveniently placed knurled knob, with a dial indicating speed at which the spindle is revolving. Bench and floor models are available.

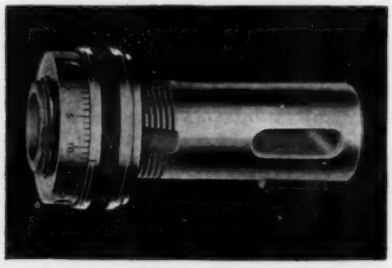
## "Molygate" Oil Faucet Prevents Dripping

Faster flow and quicker shut-off without dripping are two advantages claimed for the "Molygate" oil faucet announced by Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. Faucet is designed especially for use in dispensing lubricating oil, paints, varnishes, glue, vegetable oils, molasses and othe viscous fluids from barrels and drums. Protection against

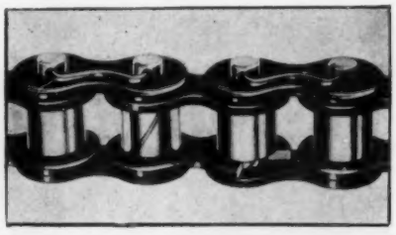
dripping has been secured by locating the shut-off valve at the very end of the nozzle. Faucet is built with a Neoprene seat vulcanized into the valve head. It is available in two sizes.

## "Micro-Nut" Adjusts Tools Accurately

Suitable for use on either single or multiple spindle machines, the adjustable "Micro-Nut" offered by the Gair-



ing Tool Co., Detroit, Mich., permits quick and accurate setting of end-cutting tools. An adjustable sleeve works independently of the screw of the nut, which is graduated to permit adjustments ranging from 0.001 to 0.020 in. When the cutting tool must be moved more than 0.020 in., the change required is easily and quickly made by loosening the Allen screw in the "Micro-Nut" and turning the nut on the screw thread at an approximate estimate of the extension or retraction required, one complete turn of the whole unit being equal to 0.083 in.

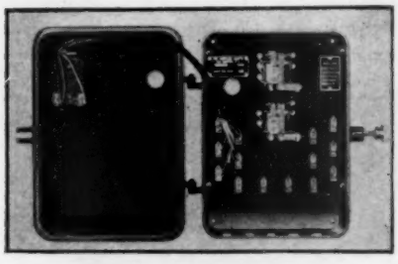


## Morse Roller Chain Is Channel Lubricated

A channel lubricated roller chain, which conforms to American Standard dimensions and is completely interchangeable with all other standard roller chains, has been announced by Morse Chain Co., Div. of Borg-Warner Corp., Ithaca, N. Y. In this round-pin roller chain, diagonal channels are rolled into the stock from which the bushing is formed. When the joint is assembled, these channels appear as spiral grooves and extend through the side plates of the bushing link. Oil on the rollers quickly finds its way to the bushing surfaces. Rollers of these chains are hardened and ground, and the cross section of the side plate has been increased, giving this improved chain the strength of conventional heavy-duty sizes. Single, double, triple and quadruple widths, all standard pitches and standard stock attachments are available.

## "Saf-T-Flame" Gas Pilot Eliminates Fire Hazards

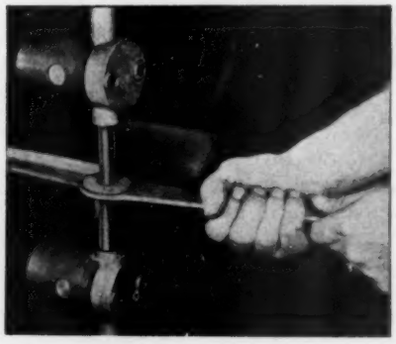
Offered by the Partlow Corp., 2 Campion Rd., New Hartford, N. Y., the improved "Saf-T-Flame" gas pilot has been designed to prevent explosions and eliminate fire hazards. Operating on the principle of electrical flame conduction, this unit completely cuts off the fuel supply in the event of



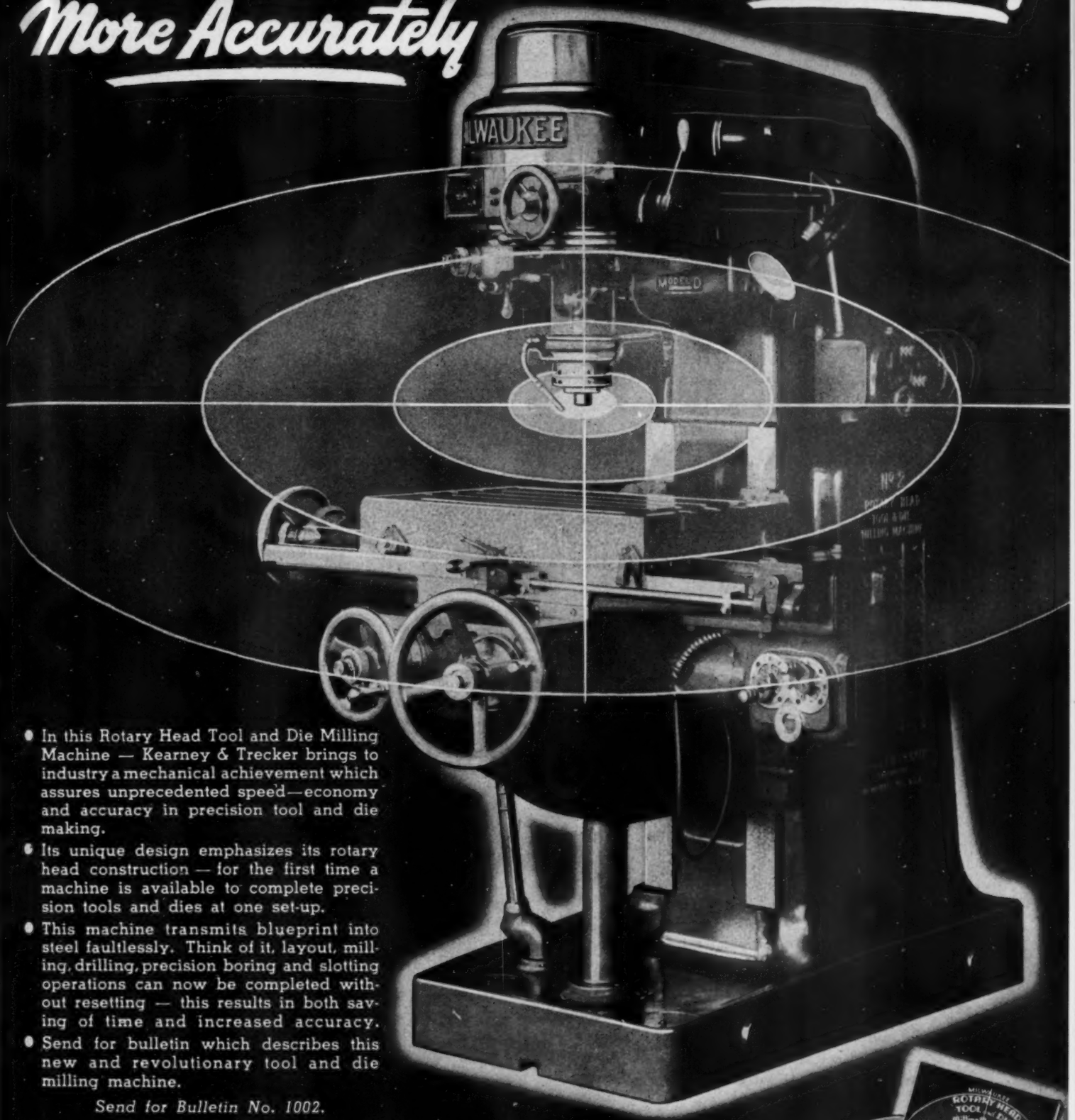
pilot failure. It will withstand severe pilot flame fluctuation, as flame always contacts electrodes due to the concentric ring of electrodes. If the high tension electrodes or the cable become grounded in any manner, fuel supply is instantly cut off. No auxiliary spark plug is necessary.

## Welding Tip Dresser Used on the Job

A tip dresser that remachines both upper and lower spot welding tips to their correct profile "on the job", without necessitating removal of the tips from their water-cooled holders, has been brought out by P. R. Mal-



# *Now*.. MAKE PRECISION TOOLS AND DIES IN A SINGLE SET-UP.. *More Rapidly More Accurately*




- In this Rotary Head Tool and Die Milling Machine — Kearney & Trecker brings to industry a mechanical achievement which assures unprecedented speed—economy and accuracy in precision tool and die making.
- Its unique design emphasizes its rotary head construction — for the first time a machine is available to complete precision tools and dies at one set-up.
- This machine transmits blueprint into steel faultlessly. Think of it, layout, milling, drilling, precision boring and slotting operations can now be completed without resetting — this results in both saving of time and increased accuracy.
- Send for bulletin which describes this new and revolutionary tool and die milling machine.

*Send for Bulletin No. 1002.*

SEND FOR BULLETIN No. 1002

**KEARNEY & TRECKER CORPORATION**

**MILWAUKEE, WISCONSIN, U. S. A.**

lory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind. This dresser is said to save considerable "down time" and to insure the use of uniform contact area with the work. The result is better and more uniform welds, and lower dressing costs.

## "New Wrinkle" Method Finishes Parts Rapidly

New Wrinkle, Inc., Dayton, Ohio, has developed a "Dip-Process" of castings finishing which is claimed not only to insure complete coverage for all exposed surfaces, but securely seals all pores on hidden surfaces where rust-proofing is the only duty a finish serves. This process consists of three steps: (1) the casting is dipped in a thin solution of wrinkle finish, which insures complete coverage of all surfaces, (2) the casting is placed on a slightly inclined, screen-covered rack so that the surplus paint is collected in a tray for return to the dipping tank, and (3) the casting then is ready for quick spraying, which is accomplished with a minimum of waste, as the atomized material readily adheres to the wet casting surface. By letting the casting stand on the inclined rack for several minutes, the finish is given an opportunity to set. During the baking operation which follows, the "Wrinkle" finish is obtained. The process is claimed to speed the output of castings in the finishing department, and to save approximately 25 to 40 per cent of the finishing materials ordinarily required.

Every plant manager who has or contemplates a tool room should know all about this brand new Cincinnati Bickford product.

It is the Super Service Jig Boring Machine which we had intended to show at the Cleveland Exposition last month. You can see it in full detail in this new bulletin which we will gladly send, without obligation. Merely ask for Bulletin U-26.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.


## TRADE PUBLICATIONS

**ABRASIVE CLEANING** Bulletin No. 211, issued by the Pangborn Corp., Hagerstown, Md., provides 16 pages of drawings, specifications and other information concerning its vaneless-wheel "Rotoblast" cleaning machine.

**BAR MACHINES** The new Model RA-4, 6 and 8 spindle Acme-Gridley bar automatics are described in a 24-page, fully-illustrated catalog, No. M-40, published by the National Acme Co., 170 E. 131st St., Cleveland, Ohio. These machines are claimed to cut accurately at high speeds and heavy feeds.

**BELTING** The leather belting and packing edition of "Research Illustrated," published by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., contains 24 pages discussing "Vim Tred" and "Okay Tred" leather belting and "Vim" leather packings.

**BROACHING** Type XL fluid-power power variable-speed horizontal broaching machines manufactured by the Oilgear Co., 1302A West Bruce St., Milwaukee, Wis., are fully described in the 12-page bulletin No. 20,000 just announced. A specification sheet included in the bulletin gives data on the nine standard machines now available.

**CIRCUIT BREAKERS** Type FLO outdoor oil-blast circuit breakers are described in Bulletin No. GEA-2426B, offered by the General Electric Co., Schenectady, N. Y.

**CLUTCHES** The 1939 clutch catalog published by the Carlyle Johnson Machine Co., 52 Main St., Manchester, Conn., gives specifications and prices of several types of friction clutches and accessories.

**COUNTERBORES** A leaflet now being distributed by the National

Twist Drill & Tool Co., Detroit, Mich,. describes various types of spine-taper drive counterbores.

**GRINDING** Computing the r.p.m. of work and grinding wheel is simplified with a speed calculator made available by the Landis Tool Co., Waynesboro, Pa.

**HEADSTOCK** Landis Tool Co., Waynesboro, Pa., has issued an illustrated folder discussing features of its new universal headstock.

**HEAT-TREATING** Ajax Electrothermic Corp., Trenton, N. J., has issued three bulletins dealing with its high frequency induction furnaces. No. 12, superseding No. 9, describes small laboratory furnaces; No. 13 discusses equipment for inductive heating without melting; while No. EI 2 outlines recent developments in the use of high-frequency furnaces.

**INDUSTRIAL RUBBER** Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., 94 Townsend St., Passaic, N. J., has published the fourth edition of its "Manhattan Rubber Products for Industry." Emphasis is given to belting, hose, packing, asbestos friction material, and abrasive wheels.

**LATHE PERFORMANCE** Gisholt Machine Co., 1201 E. Washington Ave., Madison, Wis., has issued Data Sheets Nos. 22, 23, 24 and 25, giving performance data on a number of turret lathe jobs.

**LATHE TOOLS** Gisholt Machine Co., 1201 E. Washington Ave., Madison, Wis., lists an extensive line of turret lathe tools in a 40-page illustrated catalog. Entitled "Gisholt Standard Tools for Nos. 3-4-5 Ram Type Universal Turret Lathes," it includes complete specifications of various tools and recommendations concerning their use.

**MATERIALS HANDLING** Bulletin No. 106, issued by the Robins Conveying Belt Co., 15 Park Row, New York, N. Y., discusses features of the Robins Mead-Morrison car and barge haulage systems.

**MONEL** "Tremendous Trifles," an 18-page illustrated booklet published by the International Nickel Co., 67 Wall St., New York, N. Y., discusses the use of Monel and other nickel alloys for such parts as springs, bolts, and electrical contact points.

**MOTOR** Leaflet No. F-8496, issued by Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes a general-purpose fractional-horsepower a.c. motor for home workshop applications.

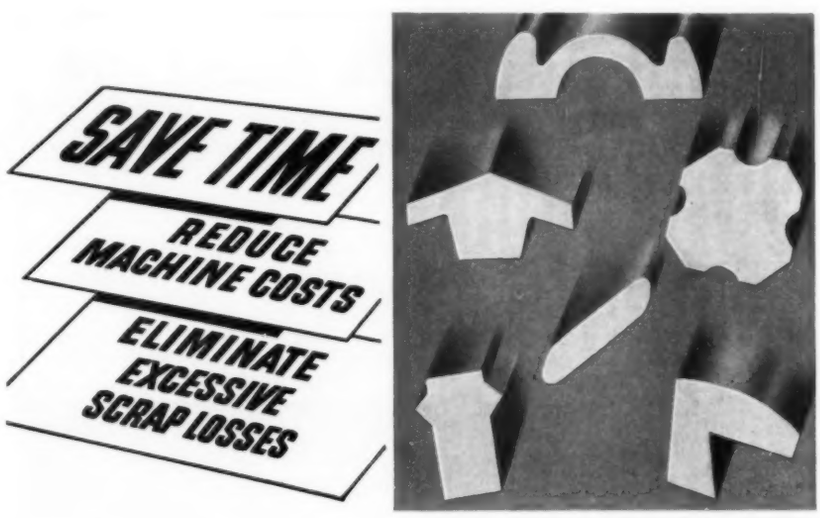
**MOTORS** Features of Type TS low-speed synchronous motors are discussed in an illustrated folder, No. GEA-137D, released by the General Electric Co., Schenectady, N. Y.

**MOTORS** Features of Type KC fractional-horsepower capacitor motors are provided in a four-page illustrated folder, No. GEA-2420, available from the General Electric Co., Schenectady, N. Y.

**OIL BURNERS** Motors and parts for industrial oil burners are described in Leaflet No. F-8487, issued by Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**PLATING** Bulletin No. ER-102, issued by Hanson-Van Winkle-Munning Co., Matawan, N. J., gives details of a line of rectifiers for producing low-voltage direct current for electroplating.

**POWER TRANSMISSION** Book No. 1574, published by Link-Belt Co., 2045 W. Hunting Park Ave.,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cold drawn special shapes

Most economy-wise manufacturers are realizing startling savings through the use of Wyckoff Cold Drawn Special Shapes. These shapes not only enable you to avoid excessive scrap and machining charges, but also effect a considerable saving in weight and freight costs.

Why not avail yourself of our many years of experience and unexcelled plant facilities in producing these special shapes efficiently and satisfactorily.

Just send us a blueprint, sketch or sample of your particular requirement, and we shall be glad to recommend the most economical solution to your problem.

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Mills at Ambridge, Pa. and Chicago, Ill. . . . Warehouse Stocks in Principal Cities . . . Manufacturers of Carbon and Alloy Steels . . . Leaded Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

Philadelphia, Pa., provides 40 pages of illustrations and information concerning many styles of "P.I.V." infinitely variable speed transmissions.

**PRESS** Details of the new Whitney-Jensen No. 58 foot press are provided in a 4-page illustrated mailing folder now being distributed by the Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill.

**PROCESS CONTROL** Bulletin No. 512, released by the Bristol Co., Waterbury, Conn., discusses a system of coordinated process control.

**PYROMETERS** Catalog No. 1101E, published by C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y., provides 36 pages of information concerning a line of TAG "Celectray" electric thermometers, pyrometers, recorders, indicators and accessories.

**SAFETY** The National Safety Council, Inc., 20 N. Wacker Drive, Chicago, Ill., has issued its 1938 surveys of accident rates in various industries. Among those available are pamphlets dealing with the foundry industry, the steel industry, the non-ferrous metals industry, and the metal products industries.

**SCREW PRODUCTS** The Allen Mfg. Co., 133 Sheldon St., Hartford, Conn., has announced publication of a 20-page catalog, No. 39, covering standard and special hollow screw products. Listed in this catalog are such products as hollow and square head setscrews, socket head cap screws, special keys, pipe plugs, counterbores, wrenches and tap extensions, as well as shoulder screws, dowel pins and die springs for the diemaker.

**SPINDLE BEARINGS** Many examples of cylindrical roller bearing applications to machine tool spindles are provided in a 36-page illustrated bulletin, "SKF Machine Tool Spindle Bearings," published by SKF Industries, Inc., Philadelphia, Pa.

**STAINLESS STEEL** A folder issued by Atlas Stainless Steel Products, Irvington, N. J., discusses the use of stainless steel castings for corrosion, heat and abrasion resistance.

**STEEL** A bulletin discussing "Stressproof No. 2" steel has been issued by Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

**SWITCHGEAR** Details of metal-inclosed switchgear with draw-out air circuit breakers for low-voltage feeders are provided in a 16-page illustrated bulletin, No. GEA-2596A, issued by the General Electric Co., Schenectady, N. Y.

**THERMOMETERS** A line of strip-chart resistance thermometers is described in Bulletin 529 issued by the Bristol Co., Waterbury, Conn.

**THREADING** The Winter Bros. Co., Wrentham, Mass., has published a 144-page catalog covering its line of taps and dies. Included are prices and complete specifications, as well as extensive recommendations, tables of commercial standards, and other useful information.

**V-BELTS** The Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., 94 Townsend St., Passaic, N. J., has published an engineering data book on the design, installation and maintenance of V-belt drives.

**VALVES** "The Inside Story of Jenkins 125-lb. Iron Valves," a 24-page illustrated booklet released by Jenkins Bros., 80 White St., New York, N. Y., analyzes factors affecting valve life and maintenance.

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